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Foundry Technical Institute, Meek's Road, Falkirk (*Telephone* 3321).

Forthcoming Events.

MARCH 26.

Sheffield Metallurgical Association:—Ordinary meeting. "Oxygen in Steel," Paper by C. H. Desch, D.Sc., F.R.S.

MARCH 27.

Institution of Production Engineers:—General meeting, 83, Pall Mall, London. "Forging Manufacture," Paper by Capt. F. W. Spencer.

Institute of British Foundrymen.

MARCH 22.

London Branch, Junior Section:—Ordinary meeting in London. J. W. Gardom will lecture on "The Manufacture of Malleable Castings."

MARCH 23.

Scottish Branch:—Annual business meeting. Discussion on General Foundry Problems.

Industrial Negotiations—Official and Unofficial.

We have been asked by several readers to express an opinion of the present situation of the proposals for peace in industry, and, more recently, for the solution of the unemployment problem, which have been put forward by the Melchett-Turner Conference, and which have been in a measure rejected by the great employers' organisations. We have previously commented on the manner in which the Melchett-Turner Conference was started, and of the very reasonable objections which have been urged against its National Industrial Council proposal, felt by many of the employers' organisations. From the beginning the Melchett-Turner Conference has had an extremely good press, and it has been equally obvious that the attitude of the employers' organisations, particularly that expressed by the British Engineers' Association, has had a bad press, the suggestion having been freely made that a number of shortsighted employers were trying to break down a promising movement towards industrial peace. This, of course, is absolutely untrue, and nothing is more likely to injure industrial progress than an attempt to discredit the motives of the employers' associations.

There are, no doubt, diehard employers, just as there are communist workmen, but in the case of responsible bodies, such as the Federation of British Industries, the weight of opinion would be strongly against mere conservatism, for these bodies contain some of the most enlightened and far-seeing employers in the country. The views opposed to the Melchett-Turner scheme are held by some of the most progressive trades in the country, so far as labour questions are concerned. About 75 per cent. of the industries in the country have worked out their own arrangements for the adjustment of labour questions, and these function smoothly. In this respect the iron and steel trade is a model to the rest of the country. It is only reasonable for an employer to feel that the people who can best settle trade disputes are the people in the trade, that is, the employer and the workman, or their representative bodies. There is real danger of friction if these decisions were subject to any alteration or appeal by another body, however important, not directly conversant with the trade in question.

Only those with ulterior motives, those who are interested not in promoting industrial peace but industrial discord, can misrepresent the attitude of the employers' associations as a blow to agreement.

We congratulate the Trades Unions on the statesmanlike way in which they have recognised this and in which they have accepted the invitation extended by the Federation of British Industries and the Confederation of Employers' Organisations, and in so doing they have undoubtedly commended their cause to public opinion, always an important asset. While we know that the employers have acted in the light of sincere convictions and with the good of both industry and labour at heart, their action has caused a certain measure of public apprehension, largely on account of the attitude of the daily press. We hope, therefore, that they will now go forward with confidence, and, if possible, avoid any steps which would strengthen this impression among the general public. Finally we might suggest that the daily press does its best to foster the project by creating a public opinion more soundly informed on the points at issue, and we hope that the new approach by the employers as a whole will merge with that of the group headed by Lord Melchett.

Foundry Developments.

At no period in the history of the foundry trades were conditions so interesting as at the present time. Foundry owners are eagerly following current developments and estimating how they will react on their own particular concerns. Primarily there is the exceedingly important amalgamation in the light castings industry. The objects of this combine comprise many factors which should benefit British trade, and the industry will watch with interest the monthly export returns which we publish, because we understand that it will be the policy of the new concern to create stocks in the various foreign markets from which immediate delivery can be given. Then, again, this concern should be able to concentrate the various types of manufactures under one roof, and something approximating real quantity-production conditions should be rendered available. If we may be permitted to advise the combine, we would suggest that their ideal should be "co-operation with the competing concerns to insure for the consumer better castings at the cheapest possible price, whilst creating for the industry as a whole sufficient wealth to maintain their plants in the highest state of perfection in order to meet and beat foreign competition."

Curiously enough, there has been created conditions for the consummation of this ideal, as, as we briefly announced last week, there has been formed a new association to take care of the commercial interests of this particular section of the industry, and it is incumbent upon every foundry owner concerned to inform himself of the proposed activities of the association. If he finds that its programme and aspirations do not align themselves with his own ideals, now is the time to use his best efforts, whilst the

organisation is still plastic, so to orient conditions that at least his view-points may be studied.

Another important factor affecting the industry is that pourparlers are being made for the formation of a steel foundry owners' federation. If this is to be an outstanding success, may we suggest that breadth of activity will be the key-note. A price-list has generally been found to be a weak basis for lasting co-operation.

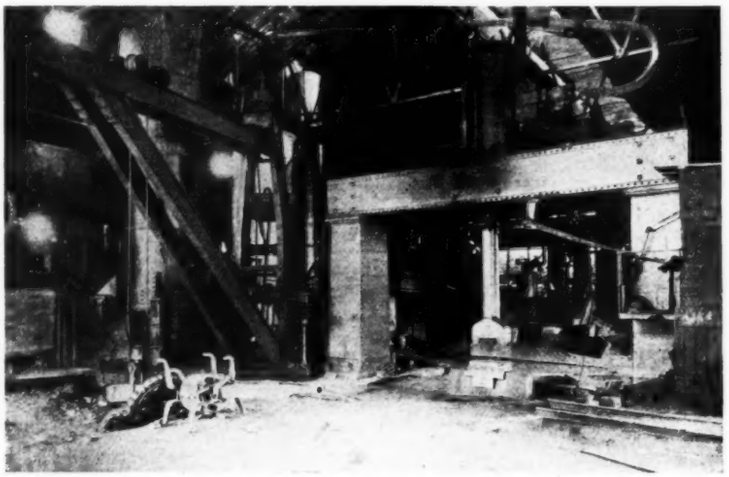
The final factors which are causing various foundry owners much thought at the moment are (1) shortage of pig-iron and coke and (2) violent fluctuations in sections of the raw material market for the non-ferrous foundry industry. Thus, with the approach of the International Conference, the Foundry Exhibition, and the general election, all of which will have their influence on the industry, foundry owners have plenty to occupy the spare moments in estimating the effect of all these movements on their own particular activities.

Foundrymen Visit Sunderland Forge.

On a recent Saturday afternoon the members of the Newcastle and Middlesbrough Branches of the Institute of British Foundrymen visited the works of the Sunderland Forge and Engineering Company, Limited, Pallion, Sunderland. This concern was established in 1887, the business being carried on purely as a forge for some years. Thirty-three years ago an electrical engineering department was added. Specialising from its inception in the manufacture and installation of electrical plant for use on board ship, in shipbuilding yards and dockyards, the company has been from the first in the forefront amongst the leading concerns identified with this class of work. Well over 2,500 such installations have been carried out, including several instances in which thirty or forty ships of one fleet have been installed with complete electrical equipment.

In 1905 it became necessary to secure additional manufacturing facilities and space for the growing needs of the electrical department, and an adjoining works were acquired. Since that date extra land and buildings have been added from time to time, the works of the company at present covering some nine acres of ground. Works and stores have also been established in Belfast, Liverpool, Glasgow, Hull and Swansea. The company has made electric generators up to about 300 kilowatts, and regularly produces steam turbine generating sets, combined generating sets, Diesel-driven dynamos, electric winches, motors, etc., for the production of which some very up-to-date machinery is installed.

The visitors were welcomed by Mr. Moore, secretary; Mr. M. E. Aird, works manager; Mr. F. H. Tebbutt, chief draughtsman; and other officials. They inspected the machine shop, the contactor department, brass gallery, fitting shop, where the electric winches are built up, winch-testing department, electrical armature winding department, test room and the forge, where some 5-ton armatures were being made, the forge machine shop and the pattern shop.



A Corner of the Forge—Sunderland Forge & Engineering Company, Limited.

Heavy Machine Shop—Sunderland Forge & Engineering Company, Limited.

Coke Shortage in the Midlands.

At the present time much difficulty is being experienced by ironworks in the Midland area in obtaining sufficient quantities of coke to keep the furnaces going, and our representative, who has been making investigations, paid a visit to the Stanton Ironworks Company, Limited. Coke cannot be obtained in sufficient quantities to keep the furnaces at these works at Holwell in full blast, and it is all the more unfortunate when there is, at the present time, a good demand for pig-iron. The position at Stanton is somewhat serious in view of the fact that the firm have orders on their books to permit of full employment of the furnaces, but lack of fuel is forcing them either to damp down or blow out some of the furnaces.

At Stanton the company had been compelled to blow out one of their furnaces despite the fact that, with a full supply of fuel, they can produce 8,000 tons of pig-iron each week. At the Alfreton works of the Stanton Company between 300 and 400 men have been placed on notice owing to shortage of fuel.

Our representative was informed that at Stanton Ironworks there has recently been a big increase in the demand from abroad for blast-furnace coke; in fact, this is in conjunction with an increased domestic consumption owing to the cold weather that has been experienced and which has created an abnormal demand for coal. The consequence has been that blast-furnace people have only been able, at the best, to obtain the bare quota of their contracts, and in some cases even less than contracted for. The secret of the whole matter appears to be that the coke makers are now finding that they can get a better price for the coke by exporting it than by selling it locally. This admission was made to our representative by a large Sheffield colliery company which holds fairly big contracts in the Midland area. Still, he insisted that they were carrying out their contracts first. "Of course," he said, "some of our customers would like an increased supply, but we are getting a much better price for export coke."

So far as local coke-makers are concerned, the plants are working at full capacity, though the Blackwell Colliery Company are only producing about half the quantity that they did a year ago. This is on account of one or two coking plants having become obsolete. "We are finding a bigger demand," said Mr. Ellis, the manager; "and we are producing to the utmost of our capacity."

An interesting lecture on the "Origin and Development of Heavy Oil Engines" was recently given by Professor W. Robinson, who was the first occupant of the Chair of Engineering at Nottingham University College.

The annual meeting of the Verein Deutsche Eisenhuttenleute (the Federation of German Iron and Steel Manufacturers) will take place in Dusseldorf on May 4 and 5. A Paper on "The Natural History of the Iron Family" is to be read by Dr. V. M. Goldschmidt, of Oslo, Norway, and Dr. A. Vogler is to give an address on present day industrial conditions.

Institute of British Foundrymen.

EAST MIDLANDS BRANCH ANNUAL DINNER.

Important questions affecting the foundry industry at the present time, were referred to at the annual dinner of the East Midlands Branch of the Institute of British Foundrymen, held at the Great Central Hotel, Loughborough, on March 2.

Dr. D. S. Anderson (principal of the Derby Technical College), in proposing "The Institute of British Foundrymen," said one of the things he liked about the Institute was its very broad principles so far as membership was concerned. Practically the only essential for membership was that a member should have a genuinely keen interest in foundry work and science. That was as it should be. At the present time there was a vast number of institutes in this country; in fact, they were practically institute-ridden; their numbers were growing every year. That only showed to what extent sub-division and specialisation was being forced upon them. He thought that some institutes made a mistake by their policy of exclusiveness—by making the qualifications too high. The functions of their Institute was that the members should meet together for the purpose of exchanging views and ideas so far as the industry was concerned. The Institute was 25 years old, having been founded in 1904, and since that time many changes had taken place in engineering and in the foundry world in particular. When it was founded the petrol engine was just coming along, the gas and oil engines were established, and the Diesel engines were struggling for a place. To-day the petrol engine reigned supreme both on road and in the air. The engine was really a marvel of engineering skill. A great measure of the credit for that performance was due to the founders of this country. With regard to the steam turbine, the largest unit in existence at one time was one of 1,000 kw., but to-day there was in New York one of 16,000-kw. capacity, and there was an engine shortly to be introduced of 208,000 kw. At one time steam pressure was 280 lbs. per sq. in., but now it was 1,200 lbs. per sq. in. The problems had all gradually been overcome, and while there were fresh problems which came along they, too, would be overcome in time. The part taken by the foundrymen in the future progress of industry would be quite as praiseworthy as in the past.

Dearth of Entrants.

Mr. S. H. Russell (President of the Institute) said much of the success of the Institute was due to the fact that the members were very free and frank with one another. They were all out to help each other as far as they possibly could. Considering the very difficult times the industry had been passing through, he thought it somewhat amazing the progress that had been made in the production of castings, and, moreover, he thought they in the East Midlands had got excellent examples of modern foundries—foundries which he did not think were equalled in any other part of Great Britain, on the Continent or in America. He was extremely sorry that one of their members had had the misfortune of a disastrous fire—Qualcast, Limited, of Derby—"and I can only wish him every success in overcoming the difficulty that he has been placed in." The firm, he said, was one of the most progressive in Great Britain. "The problems of the jobbing foundry had not quite been successfully solved," he said, "for supposing we were all asked to increase output by 50 per cent., why! we could not do it." They knew they could not do it, because the supply of skilled labour was not there. They were not training the moulders. They could not get the boys. There was no doubt about it that part of their troubles could be traced to the fact that, when the free-scholarship system was enlarged that more boys went to the secondary schools, and to-day something like 30 per cent. of the secondary school boys were those who had gained free scholarships, and would not have been there but for that fact. The new system took all the boys from the old council schools, boys who otherwise might have gone into the foundries, with the result that to-day boys, who left the secondary schools at the age of 16, did not want to go into industry—not just the foundry but any kind of industry. "They don't want to do work that means getting up early in the morning and work that will dirty their hands," he said. Of course, he did not blame the educational authorities, or the system entirely, because he thought it essential that a boy should have a real good education. "Our problem is that so many, many boys are drifting into non-productive industry and only a very small proportion coming in. In the iron industry we are getting practically none of these boys. There are exceptions, but speaking generally we don't get the type of boy we want. Even with the type of boy we do get, we are really giving them the best we can. Most of you here to-night know that the foundries have all installed moulding machines to a great or lesser extent, and that the jobs we used to give the boys—'flat backs'—are almost invariably put on a machine. We have not got the jobs to give to the boys, therefore, we don't quite encourage them to make moulds. We keep them on core-making too long and, therefore, they drift out of the industry. Under present conditions we have to offer them more difficult work, which we have to scrap because of the inefficiency of the boys when they have done it. Still, it is a problem that has got to be faced, and until solved we shall not be able to successfully train the limited number of boys we do get."

Cheaper Cores Essential.

The other big problem the foundry industry had to face was the cheaper production of cores. He did not think they had yet got down to the machines for making cores, and their next step would be to cheapen the production of cores to meet any limited quantity and a few at a time. There were machines being put on the market now. It was obvious if they had cheap labour they would have to increase their material costs. They had got to find some way of decreasing the cost of core making. Another very noticeable factor in the history of the founders was the far greater appreciation of the scientific knowledge that was available. Many foundries to-day, in fact, nearly all of them which did not have a laboratory of their own, employed a consulting analyst to a far greater extent than even a few years ago. He had found that many foundries regularly employed a consultant to keep them out of trouble. "We look to the scientists for assistance," he said, and went on to say that he thought the country was looking for scientists on even a more important field. They had all been rather glad to read the reports of the increase in the coal trade, particularly in the export trade, but he would remind them that it was not a sign that the old trade was coming back, but simply owing to the weather—the Arctic conditions they had all of late been experiencing. The conditions which created a demand for British coal no longer existed, and this was where the scientists could come in. It seemed to him that the British ships and cars were driving by oil or petrol secured from abroad, yet they had got all this material locked up in their coal deposits, if only the scientists could find a way of extracting it from the coal. He thought the recent increase of 2¼d. on petrol might be a blessing in disguise and would tend to make England produce a home-grown spirit instead of buying it from abroad.

Another great development to-day was pulverised fuel, and at the present time ships were making an experiment with it. There was no doubt that in the next few years technical and scientific discoveries would be made which would develop the use of pulverised fuel, which would create an additional market for the coal industry. If industry once got back on to its feet, it was pretty obvious that the other industries were going to follow, and then they would have a flood of prosperity.

Advisory Committee Desired.

Dr. H. Schofield, who proposed "The East Midlands Branch," said, so far as Loughborough was concerned, it possessed, at any rate, one of the very few technical institutions in England which had endeavoured to teach practical foundry work, but he regretted there were not more aspirants ready to come forward to be taught. It was a matter of deep regret that the local boys did not take the opportunities that were placed before them, and he would suggest that the Branch take the matter in hand. "Would it help you as a branch," he asked, "if we formed an advisory committee for the benefit of teaching young men?" Indeed, it was almost a tragedy that the number of foundry apprentices and young foundry workers in general was so small when they (the authorities) were only too pleased to help the boys in technical education. If the Branch would agree, they could be assured of 100 per cent. advice from the technical education authorities. "You have only to tell us what you would like us to do, and it shall be done," he said, adding that he was anxious to locate where the present fault lay. There was no doubt that a "slip" did exist, and it ought to be the duty of the Branch to rectify it. They were anxious to get the foundry apprentices into the college so that they could be taught something useful about the foundry trade. Considerable progress had been made in the foundry industry during recent years, and if all that had been said was true, then it was all the more important why the young men should be taught more about the craft. It would become increasingly more important if the foundries were to cope with the requirements of engineering design in the future. It had been said that life was divided into three parts—time and no money, and that was the position the boys were in to-day; the period when they had money and no time, and that was the position they were all in to-day; and the time when they had both money and time, and no inclination. The young foundrymen to-day had time, and it was up to the authorities and also the Branch to see that they utilised it.

More Attractive Quarters.

Proceeding, he mentioned that, Mr. H. Bunting, their Honorary Secretary, had given him a balance sheet of the position of the Branch, and on perusing it he thought they were to be congratulated on the extraordinarily economic manner they managed the affairs of the Branch. "We are always pleased to entertain you at the Loughborough Technical College," he said, "and it is going to be our endeavour to make the quarters far more comfortable for the Branch than what they are at present." The Technical Education Authorities felt it was part of their job to place everything at the disposal of those who were anxious to make use of it. Personally, he was always willing to sacrifice time to discuss problems so far as the foundry craft was concerned, and as long as the members were willing to do that there was no fear for the progress of the British foundry. He paid a warm tribute to Mr. H.

Bunting for the great work he did on behalf of the Branch in order to advance the technical knowledge of the members.

Branch-President's Reply.

Mr. J. Lucas, in responding, expressed thanks to the proposer of the toast for the compliment he had paid the Branch, after which he read several apologies from members who were absent owing to illness. Among the list were Mr. T. Makemson, Mr. V. C. Faulkner, Mr. Hammond, Mr. H. H. Moore, Mr. P. Russell and the Mayor of Loughborough. Mr. Bigg, one of their executive members, had been unable to attend owing to a very disastrous fire at the Derwent Foundry, at Derby, that morning, and he wished, through The Foundry Trade Journal, to extend the sympathy of the Branch to Mr. Bigg, and hoped that the trouble would soon be rectified. With regard to the training of foundry apprentices, he said he would be pleased to see more of them coming into the industry and also attending the classes at the Technical College. Of course, sometimes he sympathised with the lads, for when they had been in the foundry all day they did not like tackling the work again in the evening. On the other hand, what could they do? When the lads had finished in the foundry they seemed to prefer going to the picture palaces and dance halls instead of attending the instructional classes. He was sorry to say it, but still it was a fact. He could assure Dr. Schofield that the Branch would endeavour in the next few months to tackle the problem and form an Advisory Committee in an effort to persuade the lads to attend the classes which had been opened out in order that they might obtain a better knowledge of the foundry industry.

Mr. J. Lucas, proceeding, said: "The Branch was unique in that its Secretary has held office longer than any other branch secretary and is still hard at it. The East Midlands Branch was formed in 1915, arising out of the Leicester Convention of 1914, but its first meeting was not held until October, 1916, while its first works visit was held in November, 1916, when the two largest engineering works in Loughborough were visited, the visitors being entertained to tea in this room by the Directors of Herbert Morris, Limited; afterwards adjourning to Loughborough College for a lecture by Mr. J. E. Hurst on the 'Rarer Elements and Alloys of Cast Iron.'

"In those difficult days of 1916 and 1917, it seemed an almost impossible task to raise any enthusiasm, and the Council felt the need of a strong hand to lead and guide the destinies of the Branch. Mr. Moore was invited to become President, and though a very busy man undertook the job, and in the two years of his presidency set the Branch on a firm foundation, upon which it has built and prospered ever since.

"The Branch now numbered 120 members, and it has the support and backing of many large firms, such as the L.M.S. Works, Ley's Malleable, and the International Combustion Company, all of Derby; the Stanton Ironworks Company, of Stanton; Worthington-Simpsons, of Newark; Hammonds, of Syston, and many others.

"It was also fortunate in that it had placed at its disposal the resources of the technical colleges of Leicester, Loughborough and Derby, and the full sympathy and help of their respective principals. Dr. Schofield early recognised the educational value of the Institution, and placed the resources of the Loughborough College at its disposal, and his example was followed by the Colleges of Leicester and Derby.

"The Branch was looking forward with pleasure to entertaining the overseas visitors to the International Convention next June, on the day when they are to pay works visits at Derby, and be entertained at Matlock, and the Branch Council had the arrangements for the visits and hospitality well in hand."

Helping the Foundry Apprentices.

Mr. T. Goodwin, who proposed "The Visitors," said various colleges to-day were giving special attention to the practical side of education in the trade as well as technical education, and he was glad to hear that both Dr. Kershaw and Dr. Anderson had promised to do all they could to help forward the education of foundry students. Reference had been made, he said, to the improvement in materials, and, so far as he, personally, was concerned, he could say that when he commenced his career in the foundry they were at that time producing approximately 1,000 tons of castings per week; also they were producing probably another 1,000 tons of pig-iron, and, moreover, they were also making their own coke for the blast furnaces. "But in those days," he said, "we were wasting thousands of pounds." Science and the chemists had since come along and discovered the use of by-products which to-day were even more valuable than the pig-iron they made. Therefore, it only went to show the value of education and science in the foundry industry. No foundry to-day could afford to be without a metallurgist in some form or other.

Dr. Kershaw said they were pleased in Leicester to know that the President of the Institute had been chosen from their city. With regard to the supply of skilled labour for the foundry industry, he said it was one of the questions about which Leicester was very deeply concerned. Mr. Philip Russell had been kind enough to take the classes which had been commenced, but foundry boys had not responded, and Mr. Russell said these were the very persons to whom he wished to lecture.

When it came to classes in metallurgy, these were well attended, but this was training men at the top instead of at the bottom of the ladder. The majority of the lads who attend the secondary schools adopt clerical work, but ninety per cent. of these young men should go into the engineering, and particularly the foundry trades. There are good positions to be obtained. It was in their interests that the best brains should be put into the foundry industry. The majority of those who would wish to attain some important position would need a good secondary education. Alluding to the progress of the industry in the quality of the work turned out, he declared that a still higher efficiency was to be obtained. Dr. Anderson had mentioned what had been accomplished in New York, but even that would be exceeded very shortly by a certain Liverpool firm. At Leicester they now had a cinema and lantern combined for the illustrating various problems in the foundry industry.

Mr. J. F. Driver agreed that the lack of many foundry boys attending the technical classes was a serious matter. He thought it would be an advantage to get patternmakers to attend educational classes also, as many troubles in the foundry had their source in the pattern shop.

Mr. H. Bunting, acknowledging the compliment of a Syston member, referred to the progress the Branch was making. During the last two years they had increased their position by 50 per cent., which was most gratifying, and this he attributed to the growing interest that was being taken in foundry matters in the area. He said that the Institute was considering the question of national foundry certificates, and the innovation of these should bring a greater influx of students into technical institutions to learn the principles of foundry work. Loughborough was fortunate so far as provision for foundrymen in technical colleges was concerned, but other parts of the area had not the same facilities. Derby, as a foundry centre, was anxious that some provision should be made. He assured them that the Institute was prepared to help the educational authorities in getting the foundry students to attend the classes, and said he would be only too pleased to help any scheme for encouraging the teaching of foundry principles.

Random Shots.

Now that the 1929 Fair is over it is possible to pause and consider it rather more impartially than can be managed while it was running its hectic course. I was not, as a matter of fact, able to do more than visit the Birmingham section in spite of the fact that the White City was the nearer, but of course from the foundry point of view it was much the more important. After seeing a succession of Fairs and watching the lines of development, certain impressions tend to emerge.

* * *

From the beginning the Fair has been characterised predominantly by the type of exhibit which can be sold "over the counter," so to speak; the type that may be counted upon to appeal to thousands of retailers throughout the country and abroad rather than to a small group of trade buyers. The engineering and heavy industries have certainly come into the show increasingly of late, but even here the same tendency is to be observed. It is the small plant or power unit such as the gas engine and the electric motor that is exhibited, and that arouses the keenest interest.

* * *

Of course neither section can yet be compared with Leipzig as a trade fair on a large scale. Probably neither will do so until the construction of the Channel Tunnel reduces the present obstacles to easy intercourse with the Continent. But apart from the mere question of the scope and the variety of exhibits, the Leipzig Fair, like all Continental fairs, always gives an impression of having been conceived, planned, and organised with a degree of artistic perception that has hitherto been conspicuous by its absence in this country. We in England are singularly slow to realise the importance of an appeal to the eye as well as to the intelligence. A recent tendency towards more artistic railway posters may be taken as a sign of grace—but the grace would be the greater if the tendency applied to railway porters as well as railway posters!

* * *

A "Coming of Age" is always an event of especial interest, and hence the recent meeting of the Institute of Metals this week was an event of unusual magnitude in the metallurgical world. To celebrate the occasion, the usual annual dinner at the Trocadero was followed by a dance, an innovation which proved extremely popular—so popular, indeed, that I cannot help thinking it might be imitated by other august bodies in the technical world. Dancing is not in these days confined to the young and frivolous, who, I suppose one must admit, are apt to be in a minority on such occasions!

Marksman.

Joseph Black Bicentenary Lecture.

Dr. John A. Cranston, of the Royal Technical College, Glasgow, delivered the memorial lecture on the occasion of the celebration of the bicentenary of Dr. Joseph Black, the renowned Glasgow scientist who in the eighteenth century laid the foundations of analytical chemistry, at a meeting of the Royal Philosophical Society of Glasgow on March 14. The thesis which Black submitted for his doctorate at Glasgow University had, according to Dr. Cranston, become a classic. In it for the first time chemical reactions were followed by means of the balance. Black also, by his discovery of the gas which he named "fixed air" from marble, originated pneumatic chemistry, and drew distinctions between heat and temperature. He measured the latent heat of water and of steam, and the latter was used by his pupil and friend James Watt in the great improvements made in the steam engine.

Cheaper and Better Cast Iron.*

By Horace J. Young.

Much is written on the theories of cast iron and cupola practice, but little is said by the man appointed to direct the job and whose living depends upon its financial success. He who has a restless night wondering whether a cupola on the following day will give iron of not less than 1,400 deg. C., or whether the metal will contain 3.4 instead of 3.2 per cent. of carbon, or the silicon will come out 0.1 per cent. lower than calculated, or that the cylinder-liners on the new Diesel engine will crack or not give good wear in service, is in a different position from that one of the research or academic worker. His responsibility is immense; success means that he will be said to have done his duty, failure means his ruin. This is neither criticism of the research worker and the academic man nor laudation of the foundry scientist; each is essential in his right place and valuable when used for the right purpose.

Where Economies can be Effected.

Let us take the following possibilities which apply to every foundry. Firstly, suppose a foundry with an output of, say, 50 tons weekly is using mixtures costing, say, 10s. a ton more than they need do. That is a loss of £1,200 per year of forty-eight weeks on raw metals only. Again, suppose that foundry is using 12 per cent. of cupola coke when as good or better results could be obtained with, say, 8 per cent. That would mean an annual saving of 72 tons of coke per annum, which, at say 30s. per ton, represents £108. Or suppose they are paying 30s. per ton for their coke when their work could be done as well on coke costing less. That might mean a saving of over £200 per annum. Again, suppose their melting loss is 12 per cent. Then they are charging 2,727 tons of metal a year in order to pour 2,400 tons into moulds; hence, if that melting loss could be reduced to 7 per cent., they would need to charge only 2,580 tons. To save 147 tons of metal at, say, 72s. per ton, plus the coke to melt it, means a saving of over £530 each year. Going yet further, some foundries may charge (as shown by their books), say, 2 tons of metal (pig, steel and scrap) to produce 1 ton of good castings, whilst other foundries on precisely the same work charge only, say, 1.75 tons. On a yearly output of 2,400 tons of good castings the result is that one foundry charges 4,800 tons of metal, whilst the other charges only 4,200 tons. Therefore, the first foundry is losing something like £2,500 per annum on unnecessary metal plus fuel and labour in melting and handling it.

These figures are illustrative of points in foundry practice which few people consider, and fewer possess costing accounts of such nature as to show the true state of affairs. Moreover, the matters can be adjusted *only* by scientific aid.

It is impossible to do it on rule-of-thumb lines. It has been shown above that a foundry melting 50 tons weekly may be losing £2,000 per annum on its metals and cupola practice only. Applied science is invaluable to common-or-garden ironfoundry practice; amazingly few ironfoundries are run economically on the metallurgical side, and much money could be saved.

A Standard Production.

All this is apart entirely from the advantages to any foundry to be able to produce standard cast iron, namely, iron which is always alike. To be capable of making it means that the moulders are given always the same kind of metal, metal of standard temperature, composition, shrinkage and running qualities. It gives fewer foundry troubles and complete freedom from the worry of being at the mercy of any particular brands of pig-iron or of the changes from consignment to consignment of any brand. It enables a foundry to supply standard and reliable castings. The advantages are so many and so obvious that it would appear absurd to enumerate them. Yet, in another Paper, the author has shown that even in the case of important castings like locomotive cylinders—castings giving untold trouble to the moulder and of great importance to the user—he found no two cylinders alike in consignments from two experienced locomotive-cylinder foundries.

Rule-of-Thumb Fallacies.

Let us look into the truth about rule-of-thumb mixing of irons. How is it done? Why should it no longer be adhered to? The last question may be answered first, the answer being that a rule-of-thumb mixture is always at the mercy of changes in the pig-irons composing it and, further, the foundry has to buy irons *regardless of price*, because it dare not change. An actual example, of which there have been hundreds before the author's notice, may be given.

One foundry making ordinary engine castings had a mixture consisting of:—25 per cent. of a pig-iron A, costing 86s. per ton; 25 per cent. of a pig-iron B, costing 84s. per ton; and 50 per cent. of scrap iron; therefore, the cost of that mixture as charged was about 76s. 6d. per ton. This mixture suited their work, and when they tried an experimental mixture they got bad results. This is what actually happened:—Pig-iron A contained 3.2 per cent. total carbon, pig-iron B contained 3.3 per cent. total carbon, and their scrap contained 3.6 per cent. total carbon. Hence their mixture, as charged, contained 3.43 per cent. total carbon. But the new experimental mixture which they tried was made from pig-iron C, containing 3.7 per cent. total carbon, and pig-iron D, containing 3.6 per cent. total carbon. Therefore, this new mixture contained 3.63 per cent. total carbon, which was too much to suit their work, and trouble resulted. The author was able to choose for them pig-irons at 75s. and 73s. per ton, which, properly mixed, gave them their usual good results, the mixture, as charged, costing 69s.

Or take another not uncommon occurrence. One foundry was using an iron at 72s. per ton, whilst another foundry doing the same work was using an iron which cost 85s. per ton. Both foundries declared they could not use the iron the other one was using. The answer to the problem was that the cheaper iron contained only 1.6 per cent. of silicon, whereas the more expensive one contained 3.5 per cent. It was an easy matter to adjust the mixture of the foundry using the expensive iron so that they could use the cheaper.

The success of a mixture depends upon (1) the amounts of carbon, silicon, phosphorus and manganese charged into the cupola, and (2) the amounts of these things in the metal tapped from the cupola. Therein lies, firstly, the crying need for foundrymen to be able to purchase standard pig-iron, namely, iron of known quality in each consignment, and, secondly, to work their cupolas so that the metal is affected in the same way every day of working. It is by no means necessary that the standard pig-iron should be always alike, but what is essential is that each consignment should have a stated composition.

For instance, the author used to purchase a certain iron which, amongst other things, contained 1.5 per cent. of manganese. Then a consignment arrived which contained only 0.6 per cent. Had he used it as if it had been the same as before—namely, had he not altered his mixture—his castings would have been unsuitable or, perhaps, even faulty. In this connection the author has met frequently with the remark, "We use the same mixture, but the iron nowadays is not what it used to be." Obviously, as pig-iron varies frequently and as rule-of-thumb mixtures never vary at all, the blame should not be laid upon the iron, but upon the method of mixing it. Standard pig-irons will solve these difficulties of the foundryman, and, instead of paying blindly for iron which could be replaced by irons nearer home, he will be able to trust to the iron delivered being something similar to the last lot, or, at any rate, he will be told what the differences are and allow for them in his mixtures.

Total Carbon.

Pig-iron suppliers appear reluctant to mention total carbon. Yet it is one of the most important and vital things in cast-iron foundry-work. It is often at the root of the success or failure of a rule-of-thumb mixture. Suppliers of pig-iron should overcome their diffidence and plainly state the facts of the case, namely, that under ordinary blast-furnace conditions it is impossible to control the amount of carbon in the iron produced—the amount is what the furnace happens to give. Moreover, it is seldom low, meaning to say, it is seldom under 3.3 per cent., and may go as high as 3.8 per cent. in the next lot of the same iron. Hematite irons often run as high as 4.0 per cent. or more. These matters, like seasickness, are nothing to be ashamed of, yet iron people have got into the unfortunate habit of concealing them. Some go further and publish pamphlets showing amounts of total carbon which are far lower than those in the iron delivered.

This is bad for the industry, and stifles progress. If an ironfoundry has got good rule-of-thumb mixtures, it can retain them as long as the pig-iron delivered is always the same, or thereabouts. This is what standard pig-iron, or iron of known composition in each consignment, will do for them, and nothing else can do it. At the present moment, if a foundry requires anything of this nature, it has little else it can do but use extremely expensive and reliable irons.

Variables in Pig-Iron Analyses.

When the author is called into a foundry for the purpose of either furthering economy or of producing high-duty cast irons, his initial task is always that one of finding out what irons they are buying and whether those irons are worth the money being paid for them. For example, one foundry was purchasing three expensive irons, which we will call A, B and C. They used these irons because of their advertised compositions and qualities, and this is what the author found:—

Iron A.—Advertised as containing 3.0 to 3.5 per cent. of carbon; actually it contained 3.7 per cent. and was no better than a cheap iron.

Iron B.—Advertised to contain a maximum of 3.2 per cent. of carbon, when analysed it had 3.5 per cent.; also it was advertised to contain 1.5 per cent. of silicon, but it contained 1.2 per cent. Hence here again the iron varied as greatly as, and was no better than, a cheap iron.

Iron C.—Advertised to contain 3.3 per cent. of carbon, 3.5 per cent. silicon and 1.3 per cent. of manganese. When analysed it was found to have 3.7 per cent. carbon, 1.8 per cent. silicon and 0.7 per cent. manganese. In this case the variations were worse than those met with in cheaper irons.

Anyone relying upon rule-of-thumb mixtures and advertised compositions will appreciate the fallacy of the whole procedure under such conditions. Apart, however, from the question of quality comes the more important one of price. Why should a foundry pay a high price for an iron which varies and is no better than a cheaper iron? There must be thousands of

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* A Paper read before the Lancashire Branch of the Institute of British Foundrymen, Mr. E. Longden presiding.

pounds thrown away annually by foundries working on these lines.

Refined Pig-Iron.

Refined pig-iron is valuable when used carefully, but to mix it without knowledge is throwing money away. Some refiners make a kind of slogan of saying that to get low-carbon iron out of a cupola one must put low-carbon iron into the cupola. The truth of that is not appreciated sufficiently. Foundrymen should translate it thus: "It is folly to pay big money for low-carbon iron and then go and mix it with high-carbon iron." It is like buying distilled water and putting it into a dirty bottle. Refined iron is a luxury; the less one can use of it the more economically will the desired result be obtained. In one case where a foundry was using 75 per cent. of a refined iron costing about 140s. per ton, the author, by changing the remainder of the mixture and using only 50 per cent. of the refined iron, was able to get precisely the same results. Extravagance in the use of refined iron is bad for the makers of that material, because it prohibits its legitimate employment over a wide range.

Use of Steel.

The effects of steel in a mixture depend upon the remainder of the mixture as well as upon the steel. For instance, if 20 per cent. of steel is added to 80 per cent. of irons containing 3.5 per cent. of carbon, then the mixture charged will contain 2.8 per cent. carbon and the cupola, if worked properly, will give a cast iron containing, say, 3.3 per cent. carbon. But if 20 per cent. of steel be added to 80 per cent. of irons containing 3.9 per cent. carbon, the mixture charged will contain 3.1 per cent. and the iron tapped may easily have as much as 3.5 per cent. Low-carbon cast iron can be made in the cupola, but there is no proof that pearlitic-cast iron containing, say, 2.7 per cent. of carbon is as good as pearlitic iron containing, say, 3.3 per cent. carbon. Perhaps one day we may be able to make low-carbon iron better than any other iron, but that day has not yet come. A cupola is capable of giving the same cast iron day in and day out all the years of its life, and that irrespective of the pig-irons used. It is solely a matter of controlling the cupola and using standard pig-irons.

That it is impossible to judge an iron by its fracture is proved conclusively by reason of the fact that those in charge of blast-furnaces cannot do it themselves. A blast-furnace manager said the other day that frequently he has to supply the wrong iron to purchasers who will have iron of the same fracture. To judge iron by fracture is like voting for a candidate because he is nice to look at.

There is not one iota of evidence to show that cast iron containing 0.05 per cent. of sulphur is any better than that containing three times the amount, namely, 0.15; indeed, for wearing purposes, the latter is superior. The foundryman should never pay high money for very low-sulphur pig-iron.

Perlit and Pearlitic Irons.

Pearlitic iron became a password for most castings shortly after Perlit-iron got known in this country. People said: "Our iron is pearlitic, *therefore* it is Perlit iron." Others said: "We have used hot moulds since childhood, *therefore* we make Perlit iron." There is no "therefore" permissible in either of the above statements. The scientific fact is that it is impossible to make Perlit iron save by the use of the Perlit process, which was unknown until the inventor disclosed it. It might be mentioned in this connection that the author has made pearlitic iron ever since he made any iron at all, which goes to show that all is not Perlit which is pearlitic.

A study of the Perlit, Emmel, superheating, agitation and such-like processes appears to indicate that the weakening effect of graphite upon cast iron is not to be ascertained from the quantity of graphite present . . . one might suggest that graphite flakes are merely the footprints of the burglar and not, as we have been thinking, the burglar himself.

Cupola-practice is the bugbear of people trying to produce standard cast iron or high-duty iron. One can reduce coke consumption, one can talk about cupolas, but to walk into a foundry and produce metal of 1,400 deg. C. tapping temperature and having the desired carbon content every time is another matter altogether. Every cupola has to be treated differently. But are any two cupolas alike? The author makes bold to state that with his present knowledge he could design two cupolas which would work precisely alike and which could be controlled with ease. There is too much attention paid to "gadgets" and too little to fundamental points, which are, air-supply, air-main, air-belt, air-inlets, diameter and total height. Get all these correct—not what they ought to be on paper, but what experience shows gives the correct results and control—and the cupola is no longer a fickle maiden susceptible to the charm of one particular cupola-man but, instead, a furnace to be worked properly and when so worked will give every time the desired and anticipated result as regards quantity, quality and temperature of metal. The trouble to-day is that the cupolas are there and one has to do the best one can without spending money on them. People putting up new foundries should be wary about their cupola installations.

The theme of this paper is the great opportunity that exists to make economies in an iron-foundry—the larger the foundry the greater the opportunities. It is possible, on the metallurgical side, to examine the books, mixtures and cupola-practice of a foundry and say straightway whether economies can be made, and it is seldom that they cannot. Granted that it is only to be done after years of experience in foundry-work, but once done there is money saved for all future time, and the knowledge gained will lead the foundry to better work in every direction. The production of high-class irons can come only after control has been gained over the cupolas and mixtures. The author has in mind one foundry where it was possible to teach them how to make the higher classes of cast iron but, at the same time, to reduce the cost of making all their irons, both common and good.

Foundry Social Gathering.

The staff of Messrs. Jones & Campbell, Torwood Foundry, Larbert, held a successful whist drive, supper and dance in the Plough Hotel, Larbert, recently. Mr. P. F. Jones presided and welcomed all present in the name of his colleagues and himself, and expressed the hope that the opportunity afforded of social intercourse would only still further strengthen the cordial relations that existed between the directors and staff.

Moulders' Wages Agreement.

An agreement has been reached between the National Light Castings Federation and the Trade Unions for the revision of wages of iron-moulders employed in the production of hot-water and rain-water pipes. The agreement provides for a reduction of 5 per cent. in two instalments, the first to take place on March 18 and the second on May 6. About 1,000 men in Scotland and England are affected by the agreement, which follows the lines of similar changes made for other classes of workers in the same industry in recent months.

An order for a cargo steamer of 6,600 tons deadweight has been received by Messrs. Robert Thompson & Sons, Limited, Sunderland, from Messrs. Headlam & Sons, of Whitby. The North-Eastern Marine Engineering Company, Limited, Sunderland, will supply the propelling machinery.

Powdered Fuel.

At a meeting of the Institution of Engineers and Shipbuilders in Scotland, held in Glasgow on March 12, Eng.-Capt. J. C. Brand read a Paper on "Powdered Fuel." He dealt with the economics of the application of such fuel, with special regard to marine boiler firing. He showed, when dealing with costs, that coal which cost 7s. 6d. per ton in Yorkshire at the pit cost 22s. 6d. by the time it reached London.

The author dealt with three methods of using powdered fuel. The first, which he demonstrated by model apparatus, consisted of pumping the powdered fuel from the shore or floating stations into the ship's bunkers, just like oil. In the experimental apparatus the fuel could be seen pouring into a glass tank, which represented the bunkers, just like a liquid. Capt. Brand explained in detail the steps he had adopted to prevent explosions, and expressed the opinion that this method of fueling would eventually be used at sea. It would mean the establishment of a chain of pulverising stations where at present there were coaling stations, and already two of the largest coal vendors in the country had expressed readiness to erect stations as soon as the demand for such fuel materialised.

The second method involved the loading of coal in slack or run-of-mine form into the ship's bunkers, pulverising it on board, and delivering it direct from the pulverisers to the burners.

In the third method the fuel was fed from the ship's pulveriser plant into a ready-to-use bin, and from there passed by means of meter feeder to the burners.

In the discussion which followed the reading of the Paper several speakers emphasised the importance of powdered fuel as a factor in restoring the economic balance and bringing back to Britain some of the prosperity lost in post-war years.

The Duke of Montrose referred to the heavy cost of rail transport, and expressed the view that ports on the Ayrshire coast which were near the pits would be in a very favourable position when pulverised fuel came into general use. These ports, he thought, would pay particular attention to developments in the use of this kind of coal. His Grace also mentioned savings that could be effected on the Clyde pleasure steamers if ships could come alongside the wharf and have the fuel pumped into the bunkers like oil.

The advantages of pulverised fuel in locomotives and other firing was dealt with in a lecture delivered by Mr. Roosen, of Cassel, Germany, before the Institution of Locomotive Engineers (Scottish Centre) on March 14. It was pointed out that by pulverising the coal it was possible to utilise very cheap types of coal, such as lignite. Firing was mechanical, so that boilers could be built of much greater dimensions than was at present possible. The capacity of the boilers would no longer be limited by the question of grate area capable of being attended to by the stokers. The flame jets could be easily controlled, avoiding blowing off steam when descending gradients or running easy, while the time required for starting up an engine burning this type of fuel was considerably less than in the case of ordinary fuel. It may be of interest to state that for more than a year a cupola in a Scottish foundry has been working with powdered fuel with considerable amount of success.

The Iron and Steel Institute.—The Council have this year decided to present the Carnegie Gold Medal of the Iron and Steel Institute to Dr. Arthur Bramley, Head of the Metallurgical Department of the Loughborough College. The medal, which was founded by the late Mr. Andrew Carnegie, is awarded to the research worker who, in the opinion of the Council, has produced the most meritorious piece of research work in each year under the scheme of the Andrew Carnegie Research Scholarships of the Institute.

The Poumay Cupola.

A meeting of the Paisley Section of the Institute of British Foundrymen was held on February 22, Mr. George Mackay presiding, when Mr. John Cameron, J.P., Past-President of the Institute, gave a lecture on the Poumay cupola.

The Chairman, in introducing the lecturer, said that they were pleased to welcome Mr. Cameron to the Paisley Section, he was a Past-President of the Institute of British Foundrymen, had travelled extensively in America, India and the Continent, and he would be able to tell them how Scottish foundries compared with foundries in other countries. They were to listen to a Paper having special reference to the Poumay cupola.

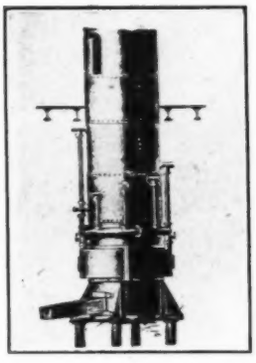


Fig. 1.

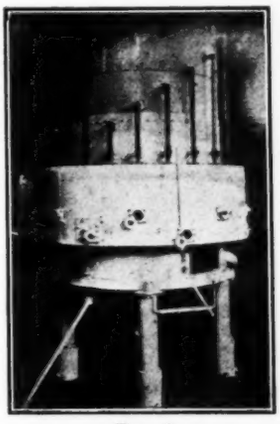


Fig. 2.

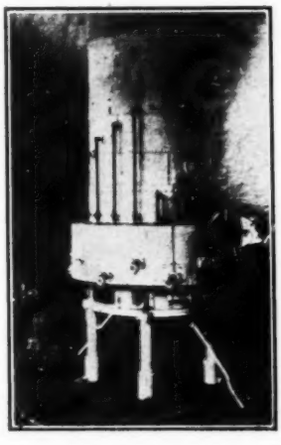


Fig. 3.

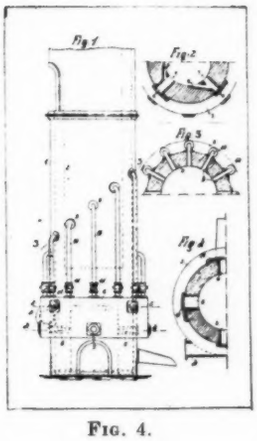


Fig. 4.

Mr. Cameron said that it was a pleasure to make his first appearance at a meeting of the Paisley section, and to have a little talk on cupolas. He said that more ingenuity had been displayed in attempting to improve the cupola than in any other department of foundry work. He had recently been reading Kirk's book on the cupola, and found it most interesting, he strongly recommended them to obtain that book as it gave an excellent idea of the development of the cupola as a melting apparatus. Mr. Cameron then showed a large number of slides to illustrate the development of the furnace. He showed the large variety of tuyeres and blast arrangements which had been tried at various times, and also the different types of construction of the cupola. He pointed out that two main ideas were evident in all these early attempts, viz., more perfect combustion of the coke and a better utilisation of the heat within the cupola, and that many of the tuyeres were designed with the idea of obtaining a gyratory motion of the air as it entered the cupola, and also to admit supplementary air supply above the main inlets. All these attempts led up to the Greiner cupola in America, which was really the same as the Poumay (Fig. 1). Mr. Cameron said that there was really no patent in the auxiliary tubes or the use of tuyeres to give the air a gyratory motion, anyone was free to adopt them, but Poumay had combined both these very old ideas, and his patent was for the combination. Figs. 2, 3 and 4 show views of the Poumay cupola.

His experience of this cupola was that it was at the moment the most economical to be had; it melted quickly and cheaply, dropped clean and required very much less repairs and saved hundreds of pounds a year in the coke bill.

Tables I and II show the coke consumption in an ordinary cupola and a Poumay, each doing exactly the same work on alternate days, and each of 54 in. dia. at the melting zone.

Table I.—*Comparative Coke Consumption per cent. of Coke used to Metal Melted, excluding Bed Charge in each case.*

Before alteration.	After alteration. per cent.
Approximately 10 per cent.	7.3
	7.0
	7.5
	6.8
	7.2
	7.0
	7.4
	6.7
	7.3
	7.5
	Average 7.17

Table II.—*Comparative Tapping Rates. Diameter of Cupola 54 ins. at Melting Zone, not altered when Cupola was converted.*

Rate per hour.	
Before alteration.	After alteration.
Tons per hour.	Tons per hour.
10.7	13.9
10.75	13.2
10.0	13.7
10.9	12.9
10.2	13.1
10.3	13.0
10.8	12.5
10.5	12.7
10.3	13.5
10.7	13.1
Average 10.52	Average 13.16

Table III showed the analyses of the gases from the same two cupolas. Tables IV and V showed the tapping temperatures and the metal analyses respectively. He found that the Poumay metal was hotter and freer from sulphur than in the case of the ordinary cupola.

Table III.—*Analyses of Cupola Gas Sample taken at Charging Door.*

Carbon dioxide.		Oxygen.		Carbon monoxide.	
Before alteration.	After alteration.	Before alteration.	After alteration.	Before alteration.	After alteration.
per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
12.3	18.0	0.4	0.2	10.5	0.15
13.0	17.6	0.2	0.4	10.1	0.10
12.7	18.4	0.4	0.7	10.9	0.10

Table IV.—*Comparative Metal Temperatures. Average Readings taken every ½ hour of run in each case.*

Ordinary cupola temperature deg. C.	Poumay cupola temperature deg. C.
1,291	1,339
1,333	1,340
1,320	1,352

Table V.—*Analyses of Metal Tapped on Consecutive Days from No. 1 Cupola and Poumay Cupola.*

Per cent. sulphur.	
No. 1 cupola.	Poumay cupola.
0.069	0.041
0.073	0.059
0.064	0.055
Average 0.068	Average 0.052
Difference, 0.016.	

He found that the 54-in. dia. Poumay furnace melted too quickly to deal with, as his work was entirely light castings, so he reduced the

diameter to 51 in. at the melting zone. The coke consumption and tapping rate of the reduced Poumay compared with the full-sized ordinary cupola is shown in Tables VI and VII.

Table VI.—*Comparative Coke Consumption per cent. of Coke used to Metal Melted, excluding Bed Charge in each case.*

Before conversion to Poumay type (54 in. diameter).	After conversion to Poumay type (51 in. diameter).
	per cent.
	6.74
	6.67
	6.57
Approximately 10 per cent.	6.34
	6.46
	6.73
	6.66
	6.76
	6.61
	6.74
	Average 6.63

Table VII.—*Comparative Tapping Rates. Diameter of Cupola at Melting Zone, 54 inches before conversion, 51 inches after conversion.*

Rate per hour.

Before conversion.	After conversion.
Tons per hour.	Tons per hour.
10.7	12.8
10.75	12.85
10.0	13.45
10.9	12.9
10.2	12.95
10.3	13.05
10.8	13.2
10.5	13.1
10.3	12.95
10.7	13.0
Average 10.52	Average 13.03

Mr. Cameron emphasised the fact that the Poumay cupola required very careful adjustment if success is to be attained. He stated that it was essential that the blast be properly adjusted as regards volume and pressure, and that a volumeter was a necessity. The Poumay was extremely sensitive to changes in conditions, and everything must be correct if good results were to be obtained. He had, as the chairman mentioned, travelled a good deal and seen many varieties of cupolas. He said that it was amazing how some of the furnaces worked at all, let alone gave satisfactory metal. It was impossible to play tricks with the Poumay cupola, if it was to work well everything must be just right. The bed had to be exactly the right height, and everything weighed or measured, and especially the air. The Poumay really required humouring until in the best condition. He found once or twice that it worked well and then fell off a good deal, and it was necessary to re-adjust things. Mr. Cameron concluded with a statement and explanation of the claims of the Poumay Patents.

DISCUSSION.

The Chairman said that he thought that all present would agree that they had heard a most interesting and instructive lecture from Mr. Cameron. He had shown a large selection of cupolas and tuyeres from which they could choose what they thought best for their own work. He thought that the most interesting point was the quick melt and low coke consumption which all foundrymen desired. Mr. Cameron had spoken from knowledge and experience and they were very much indebted to him for his lecture. He hoped that during the discussion full advantage would be taken of the opportunity to obtain first-hand information on any points they wished to mention.

Mr. Hurst said he had heard a great deal about the Poumay cupola, and had heard opinions favourable and unfavourable about it. Personally, he was not quite convinced, and would not care to say that it was so much better than any other cupola without studying it at work. He quite agreed that the cupola was the heart of the foundry, and it was for that reason that he thought very careful study and consideration was necessary before accepting all that was claimed for the Poumay. He would like to know the nature of the charge of 30 cwts. which Mr. Cameron stated he used. Was the scrap light, heavy or medium? What proportion of the charge was scrap, and what kind of pig-iron was used?

He had a small furnace 30 in. dia., and he could run a six-ton melt at 3.1 tons per hour with a coke consumption of 8 per cent. This came very near to the Poumay result. The Poumay would, as Mr. Cameron had said, require a greater amount of care and supervision, and he would like to ask Mr. Cameron if he though it would pay him to instal the Poumay. He was, at present, not convinced that it would.

He was interested to see the Stewart rapid cupola shown on the screen, as at one time he was with the firm who made it. They cut the pipe out of their own cupola, yet they sold them with the pipe. They also tried the sheet tuyere, which gave a complete circle of blast, but they had great trouble with bridging. Splayed tuyeres, they found, were of no advantage, and they tried to solve the difficulty by splitting the wind-belt in two.

He had tried many experiments with the Stewart cupola; the sheet casing was reduced at the melting-zone and later altered so that the whole stack tapered from the top to the bottom which gave rather better results. At that time the cupolas were made with three rows of tuyeres, but in their own foundry the top row were stopped up with ganister.

In the Whiting cupola they had a wide space between the tuyeres, which he disliked if they were splayed very much on the side. He altered them so that they were splayed both ways and also upwards and downwards; this gave a much increased speed of melting, and it was also unnecessary to use the very best coke.

He had been interested in seeing the tuyere in the furnace which was used for semi-steel as recommended by McLain. He would like to ask Mr. Cameron if he thought that the successful working of that cupola was due to the downward direction of the pipe, which allowed the blast to take more head, like a tuyere, to deflect the blast downward a little. The flame at the top of the furnace would depend upon the pressure of blast and the height of the door from the tuyeres. It was necessary to regulate the blast in order to get the full benefit of all the oxygen going into the cupola.

Mr. Cameron, in reply, said that he appreciated such criticism. He liked to meet a man who was not afraid to experiment with his cupola, and he recommended every member to do the same if the cupola was not exactly as they would like it to be. By experimenting and taking expert advice and guidance in the matter he could assure them that they would be well repaid.

He agreed with Mr. Hurst as to the downward deflection of the blast—undoubtedly the success of the cupola he had mentioned was largely due to the downward inclination of the tuyeres. He admitted that a cupola having a single row of tuyeres with the blast properly controlled and measured and other factors carefully adjusted was very hard to beat. He also agreed that in a cupola of 36 in. dia. it was easy to get the air to the centre and that the tuyeres should be splayed more in order to ensure a soft and non-oxidising blast. He thought that if Mr. Hurst was working with a coke consumption in the neighbourhood of 8 per cent. and in a 30-in. dia. cupola it would not pay him to instal the Poumay system.

Poumay Cupola and Semi-Steel.

A Member: Is the Poumay cupola suitable for melting semi-steel?

Mr. Cameron said he had never used the Poumay when he melted semi-steel, but that was not on account of any fault in the cupola. He always melted 10-cwt. charges for semi-steel so that the whole charge could be tapped separately, and in the Poumay, 30-cwt. charges were necessary. He had made inquiries from certain people who had told him semi-steel could be successfully melted in the Poumay.

Mr. Davis said that as a moulder interested in the cupola end of the foundry he had listened with much pleasure to the paper. He was impressed by the strong claims made for the Poumay cupola with regard to fuller use of the calorific value of the coke: hotter metal, less fuel for melting, and the quicker rate of melting. He asked Mr. Cameron if the Poumay was suitable for all classes of work, and whether it would be equally successful if employed on a smaller scale than that used by Mr. Cameron. He would like to know if the Poumay system could be universally applied to all cupolas.

Mr. Cameron said that in his foundry there was no heavy work done; he was entirely devoted to light castings. He thought that for heavy work it would be necessary to have a receiver on the cupola in order to collect the large quantity of metal. As to whether it was suitable for small cupolas, he believed that his own was the largest that had been tackled at the time he adopted the Poumay system. He thought that if less tuyeres were put in, the system was quite suitable for small cupolas, say 3 ft. dia.

Mr. T. Ball said he was inclined to think that the Poumay cupola would not be profitable in a shop smaller than that of Mr. Cameron's, owing to the small quantity of metal to be melted. The economy of coke affected by Mr. Cameron was not to be doubted, but if instead of a melt of 50 tons daily they had, say, only 7 tons daily, would the same percentage of coke hold good and would the benefits be proportional? He had had the privilege of seeing Mr. Cameron's cupola at work and had stood by throughout the melt, and was much impressed with what he then saw. He noticed, however, that the pig-iron was larger than he would like to put in the cupola and the scrap was of a fair size. Everything seemed to him to be economically carried out. He could not agree with Mr. Cameron that a receiver would be necessary for heavy work if, as stated, the cupola melted 13 tons per hour, it would be quite an easy matter to gather the metal in the ladle in a couple of hours or so for most of jobbing shop requirements. It was no unusual thing to have to hold the metal in the ladle for a couple of hours even when the metal was not nearly as hot as that obtained at Mr. Cameron's foundry. He would hesitate to advise the raising of the blast belt so as to hold metal in the well; this might involve raising the charging door and would also increase the bed coke. He would like to refer to Mr. Cameron's statement that he preferred one row of tuyeres and ask why he did not use one row in his own cupola. The Poumay which Mr. Cameron said was the best and last word in cupolas had two rows of main tuyeres.

Mr. Cameron, in reply to Mr. Bell, said that perhaps he had not been very clear in his statement about the receiver. He had no experience of very heavy castings, as his work was mainly light, such as pipes, where the metal was required to run a long distance and only about $\frac{1}{4}$ in. thick. He also meant to say that the ordinary cupola with straight lining and one row of tuyeres was excellent and hard to beat. He extended a cordial invitation to any member of the Paisley section to visit his foundry and see the Poumay cupola at work; he or his foreman would be only too glad to show them everything.

Symposium on Moulding Machines.

(*Continued from page* 203.)

Mr. D. Sharpe, of the Foundry Plant and Equipment Company, Limited, dealing with sand-slingers, said:—

The principle underlying the Beardsley piper system of sand-slinging consists of centrifugally collecting a wad of sand approximating in size to the average handful, and discharging this compressed-wad vertically into a moulding-box. The head is moved smartly over the area of the moulding-box so that as nearly as possible each wad of sand is falling alongside and not on top of the one preceding it. This gives an ideal condition as far as the mould is concerned, and is in exact conformity with what a moulder considers best practice in hand-ramming, namely, placing on a thin layer of sand and ramming this before adding the next layer. The even ramming gives wonderful venting conditions. No ramming of any kind is necessary after the sand-slinger has completed the job. The sand is fed from a travelling-belt directly into the impeller-head, where a single blade cuts off and collects on the inner surface of a liner a portion of sand which is ejected whenever the sand is relieved of pressure by the withdrawal of the tip on the impeller from the periphery-liner. The variation in speed of the impeller naturally gives considerable range of density in the effected ram. In designing the machine it was found necessary to take into consideration the synchronous-speeds on alternating-current, and thus arrived at the design of a head 16 in. in diameter, with a range of speeds of 1,200, 1,500 and 1,800, and from this range virtually all classes of moulding can successfully be undertaken. Where direct-current is available, two or three speeds can be provided at will.

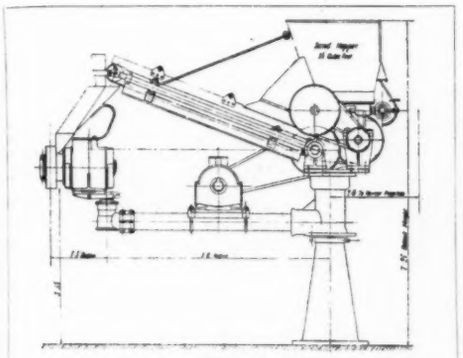


Fig. 8.

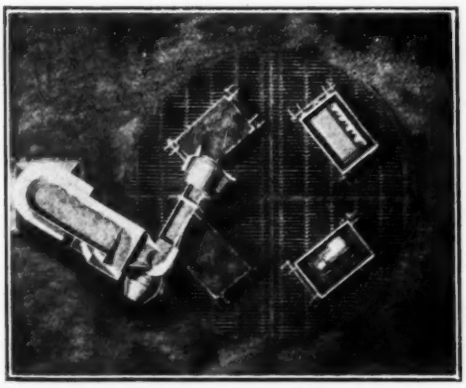


Fig. 9.

The wear and tear due to such a high-frictional speed had also to be taken care of, and the head was so designed that the wear would be absorbed by the smallest possible unit. The impeller-tip is a small casting usually made by the founder from metal, while the impeller-liner is a strip of spring-steel which can be reversed so as to be used on both faces. This change-over requires to be done two or three times per week in average work.

The sand-slinger is developed in a number of models, the tractor-type machine being one of the most complete units, and is applied to quantity production castings or to lines of jobbing-castings of a small size. The machine travels on a rail-rack moving forward at the rate of about 5 or 6 in. per minute and towing moulding-machines or a platform behind it. The screw-elevator cuts the thin surface of the face of the sand and gradually feeds it to the bucket-elevator, where it is elevated on to a vibrating-riddle, the sump of which feeds a regular supply of sand on to an endless-belt on the arm; this belt discharges the sand directly into the impeller-head. The belt moves forward exactly the width of the impeller, and approximately 3½ in. for one complete revolution of the impeller. This machine is used in a large variety of work, including axle-boxes, pipes, motor cylinder blocks, malleable-iron castings, etc.

In one particular casting, weighing 15 tons, illustrated by the author the actual ramming time for the sand-slinger was 15 man-hours, while previous similar castings made by hand and pneumatic rammer absorbed 90 man-hours. The complete mould, core, drawback and top part were made by sand-slinger, and, except for under-tucking a very few places, the complete ramming was undertaken by the slinger direct.

Gas- and oil-engine castings from 2½ to 50 h.p. are being made on portable-type sand-slingers, either singly or in quantity, in two or three plants with enormous reduction in cost. Fly-wheels for these engines are also being produced at a fraction of their previous price.

Where large foundries call for a bigger ramming capacity than the portable machine, the motive-type sand-slinger has been prepared to cope with this. The motive machine is purely and simply a jobbing mould-ramming machine. The radius of this machine is 17 ft. 6 in., and the head can be raised from 4 to 7 ft. with great simplicity. The whole arm swivels to any position on either side of the machine within its radius. A machine of this type operating in the Midlands has been one of the greatest attractions to foundrymen in this country during the past year. This machine is functioning on every grade of a large pump plant, and is dealing with virtually every casting made by this well-known pump firm.

An interesting lay-out of a foundry designed for working in conjunction with motive-type slinger consists of a long bay provided for intricate work, and eight other bays, each with its own individual cranes, which are functioning on work that calls for a quicker turnover. The motive sand-slinger operating within reach of either bay, and carrying with it approximately 10 tons of sand, completes the ramming of even very large moulds in a few minutes time.

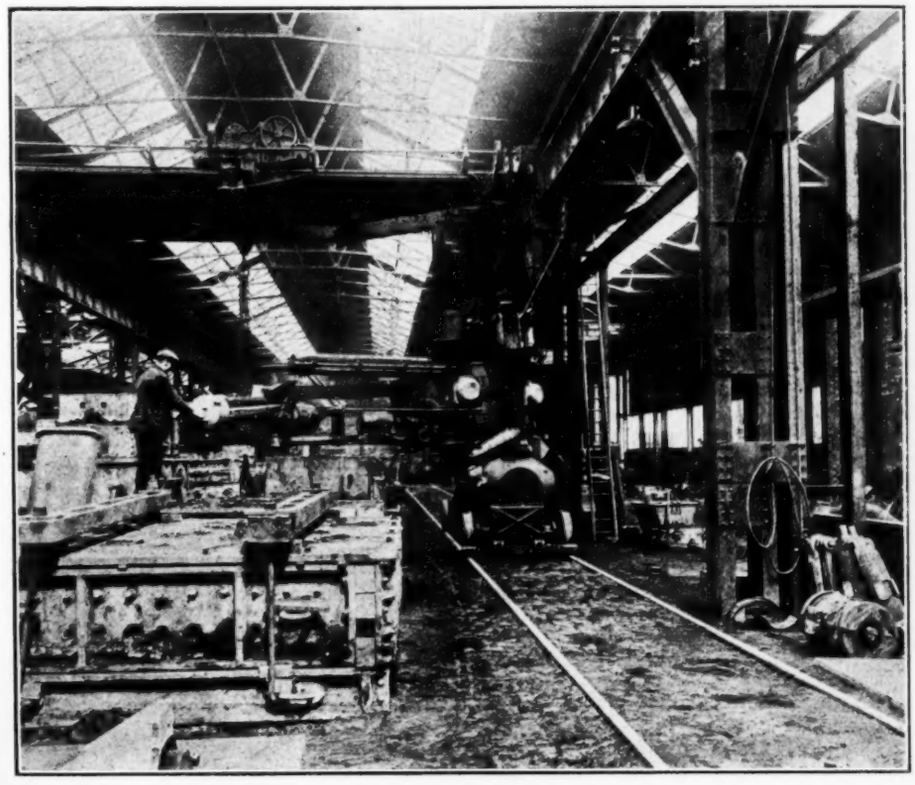


Fig. 10.

The ramming capacity of all standard sand-slingers is 10 cub. ft., or ½ ton per minute. This can be raised considerably if called for, but it is usual to estimate on a production of 5 or 6 cub. ft. per minute, as it is very difficult to take care of a greater quantity.

One American machine operates on a radius of 27 ft., and is specially designed for the production of very heavy castings. The impeller motor is 25 h.p. The machine can raise and lower its head through approximately 10 ft., and the ram is equal to somewhere in the region of one ton per minute. Castings up to over 90 tons have

been produced by the Allis-Chalmers Company, of Milwaukee, on this particular machine. Two machines of this model are operating in the same shop.

The sand-slinger has also been adopted to mass production castings in a manner difficult to conceive by any other system. Fig. 8 shows a stationary-type sand-slinger fed from an overhead sand-delivery-tank operating in conjunction with stripping-plate machines mounted on a turntable producing Ford automobile-cylinders. The production from two stationary-type sand-slingers is over 2,000 cylinder blocks per 8-hour day.

In Coventry a continuous system of stationary-type sand-slinger operating in conjunction with a turntable, roller-conveyors and a sand-preparing plant has produced results equal in every respect to anything being done in America, and is the forerunner of similar installations on this and other classes of business.

In one large shop hand-made moulds in the year 1905 produced less than 50 per cent. of

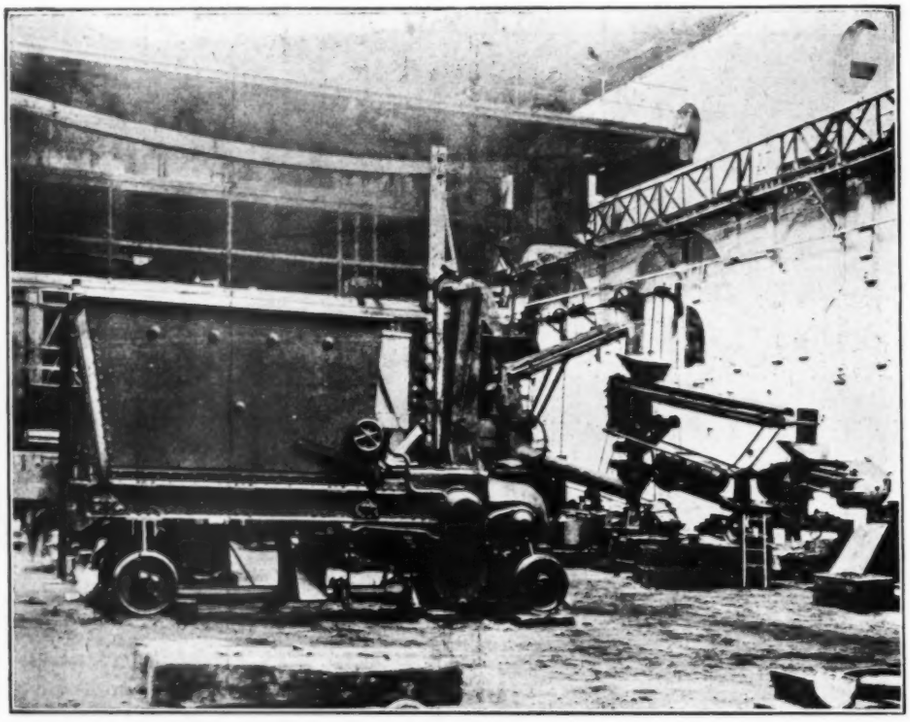


Fig. 11.

good castings, while the sand-slinger-made moulds in 1924 produced almost 75 per cent. of good castings. This relates to motor-car cylinder-blocks chiefly, and any motor-car founder will agree that the cylinder-blocks called for to-day are very much more difficult to produce than those called for in 1905, also that castings which would get passed in the former year would be rejected in many instances at the present time, the demand for a higher finish having risen to an almost ridiculous standard.

The latest development of the sand-slinger specially adapted for the manufacture of small castings consists of a machine which has a capacity of approximately 2 cub. ft. of sand per minute, and is suitable for such work as snap-flasks and small moulding-boxes. It requires very little imagination to see the enormous production possible from a slowly-moving circle of stripping-plate machines, or even bench-work underneath the nozzle of the sand-slinger. Such work as air-cooled cylinders, small malleable castings, brass castings, etc., are catered for by this machine, which, although in its infancy, has been thoroughly tested as completely practicable.

Little Things in the Foundry.

By A. L.

Necessity of Meticulous Care.

The whole of foundry-work is an illustration of the importance of little things—that is to say, the necessity for attention to detail and carefulness. These necessary attributes are naturally desirable in all occupations, and particularly so in foundry-work. If this is doubted one needs only to think of the number of trivial causes which can bring about a waster casting. It is only the causes which are trivial; the results are often disastrous.

No better illustration of these facts can be given than an example which is probably within the experience of most foundrymen. A particular casting is wanted to complete a certain job, or, it may be, to execute an urgent repair. For some reason or other the casting turns out faulty. The replace casting—now required in a desperate hurry—is rushed forward. The job is urged on; speed, and the necessity to get the job out at the earliest possible moment, being stressed. The box is hurriedly closed and poured. There is an impatient delay whilst it cools. Finally it is stripped, very often only to expose a second faulty casting. Why should this be so? What mysterious forces have been working against the production of a sound casting under these circumstances? None at all! The trouble is negative rather than positive—psychological rather than physical. What *is* lacking is the care and thoughtfulness for detail—the attention to the numerous minor points which compose the technique of sound foundry-work.

Preparation of the Mould.

This care, thought and attention to detail must begin at the start—even from the preparation of the moulding sand. One per cent. is a small fraction, yet 1 per cent. of moisture either more or less than the necessary amount can render moulding sand difficult to work satisfactorily. An incorrect sand mixture can be the starting-point for a number of troubles which may be very awkward to eliminate or even locate, at a later stage. Even the apparently simple operation of ramming requires care, especially when working near the pattern. One miscalculation or careless application of the rammer, and a shell scab occurs on pouring. The use of the vent wire seems simple enough, but how often is venting done in a haphazard or thoughtless way. If care has been taken previously, then the withdrawal of the pattern will take place with the minimum of damage to the mould. This is the stage where patience and gentleness are fully rewarded. One minute extra at this stage will save nine spent in patching—and it should not be forgotten that a patched place is always a potential source of danger. Many a mysterious trouble in a casting owes its origin to some small patched place. A broken place is usually patched with sand which contains considerably more moisture than the mould itself. This moisture is absorbed back into the mould and carries with it a considerable amount of clay bond. This is deposited behind the patch, and not only has the sand of the patch little adherence and therefore a tendency to "scab," but the layer of clay reduces the permeability and at the same time increases the amount of gas generated when the hot metal enters. The net result is a strong possibility of either a "scab" or a hole at that particular place.

The excessive use of the swab is also a bad habit which is very easily acquired. Chaplets are useful when employed carefully and in the right place, but the smallest amount of dirt, moisture, rust, etc., means trouble for the casting. A small thing, but quite sufficient to scrap the casting.

These few ideas are the merest platitudes of the foundry, and the moulder may wonder why they are even mentioned; but often it is the very familiarity with things which leads to their abuse or neglect.

Economy in the Cupola.

The question of economy is one that interests most people at the present time, and here again it is usually found that the greatest economies are those which arise from small things. Unless there is something drastically wrong in the organisation of a foundry there should be no single place where a sweeping economy could be effected, but even in the best-regulated foundries there are often many small ways in which economy can be furthered. It is the little savings repeated day by day which steadily accumulate. Take the question of coke supply. One or two per cent. extra of ash or moisture may not seem much, yet on a large quantity it becomes very important. Assuming an agreed ash basis of 8 per cent., and the coke supplied coming in with 9 per cent. ash, then for every 100 tons an extra ton of ash is being paid for at coke rates. The same applies with moisture. If, instead of the coke containing only ½ per cent. moisture, it contains 1 or 1½ per cent., then a ton of water is also being paid for at coke price. This means that instead of receiving the 92 tons of combustible material which has been paid for, only 90 tons, or even less, of combustible material will be available. Not only this, but the extra amount of ash requires extra fluxing, and creates a greater amount of slag, which, along with the elimination of the extra water, carries off a greater amount of heat from the cupola.

Not only the ash and moisture contents of the coke should be considered, but also the way in which it is burned. Too little air is almost as uneconomical as too much. If more air is pushed through the cupola than is required, more coke will have to be burned to give the same metal temperature. This is really the whole crux of cupola practice—supplying just the right amount of air.

The old Margam Copper Works at Port Talbot, which have been idle for some years, have now been acquired for the purpose of reconstruction as a modern tinplate works. The work of reconstruction is being proceeded with immediately.

Cost Accounting in Foundry Practice.

By J. O. Gray, A.C.W.A.

(*Continued from page* 185.)

Control of Authority.

With control of procedure, control of authority is a natural sequence, and may be regarded as the separation of functions into well-defined points of control. Afterwards the officer appointed becomes invested with the authority of his function. It is not difficult to imagine how these authorities would operate, or to draw up the boundaries of their authority. Each would have his particular work to do, and by sub-division one can easily cause distinctions, according to groups of like interests.

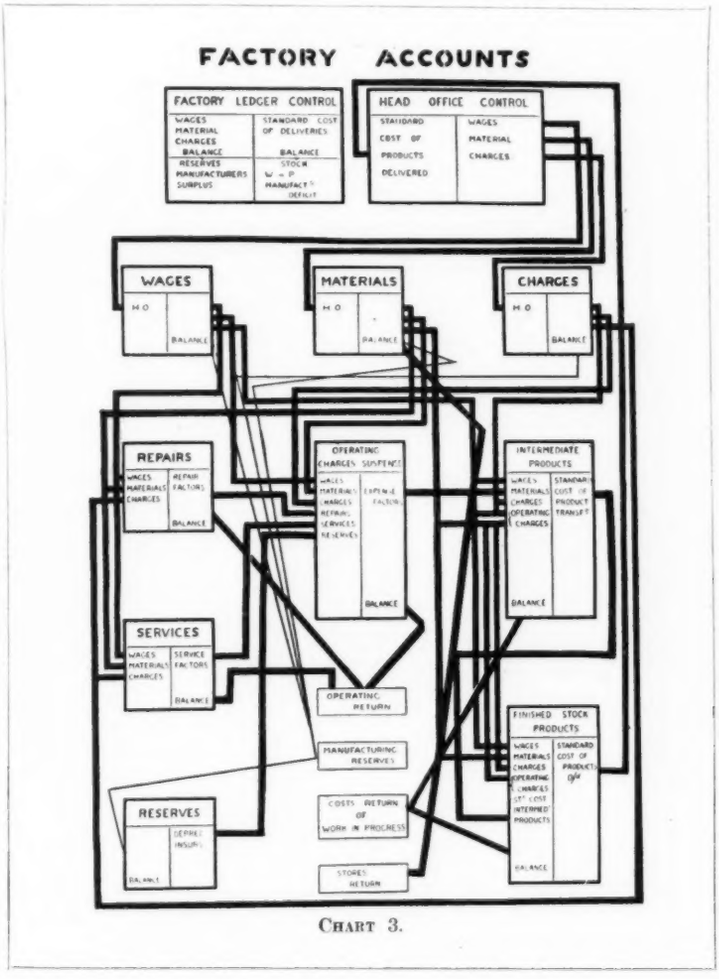


Chart 3.

As an example Chart 3 will illustrate the collection of authorities. To management, whether in the person of one or more authorities, lies the supreme authority, and from this point downward, according to the grade of authority, certain allocations of authority are made. Having outlined the functions, and points of control of authority, one must be very careful to see that perfect understanding and harmony exists between all concerned. Let everyone know that they are *all* answerable for the operation of their functions, and they will soon see that it is to their advantage to give their attention to the economical aspect of their function.

The objections to this control of authority may be said to lie in the suggestion that production suffers from attention to its operation. The suggestion is not founded on fact, because the authority is only asked to recognise the importance of its function. It is a sound principle of good management, leading to the simplification of routine, and is only irksome to the man who has something to hide.

Cost of Expenditure is one of industries' puzzles for which there can only be one solution. It is difficult to imagine how control of expenditure can be possible without control of procedure or authority. When the control of procedure and authority is definitely established, control of expenditure becomes a possibility, but without the points of control, as suggested, control of expenditure will always be a problem.

Expenditure may be put into two classes—direct and indirect—and while a certain attention may be given to the direct-expenditure, it is toward the indirect-expenditure that we have to direct our attention. It will be appreciated that direct-expenditure may be measured and controlled by means of some pre-determined standards which are comparable at various periods, but with indirect-expenditure it is often some time before the full importance is observed.

All remember occasions when the Chancellor of the Exchequer has presented his Budget of Expenditure and Receipts. In effect the Budget is made up from pre-determined estimates of departmental expenditure, based upon allowances for spending and contingencies. Against the expenditure is placed the probable revenue from all sources. In the event of a deficit between revenue and expenditure the ingenuity of the Chancellor of the Exchequer is called into account. Two courses are open to him. The first being a resurvey of expenditure, with the object of effecting economies, and the second is the increase of revenue from new sources. Control of expenditure in industry is in the nature of being the preparation of the industrial budget, with this exception:—Industrialists cannot pre-determine their cash receipts with the same certainty as the politician, but they can regulate their expenditure according to their production programme.

At no time in industrial history have contracts ruled so low nor has competition been so keen, therefore indirect-expenditure must always be kept to the minimum, and only during prosperous times can industry afford to set aside those reserves for indirect expenditure which are so necessary.

Indirect-expenditure can be considered under two heads:—(1) *Fixed*, such as rates, rent, taxes, insurance, depreciation and the like (expenses which do not vary with production), and (2) *Fluctuating*, such as repairs, maintenance, renewals, which can be arranged according to production.

Taking the production-programme as the basis, and from records of previous years it will be possible to arrive at the percentage to be added to direct-costs to allow for fixed expenditure. Then by a valuation of the possible production it should be possible to ascertain the margin or balance which remains after deducting the direct-labour and material-costs plus amount set aside for fixed-charges. The percentage for indirect-expenditure is then ascertained. By dividing the sum agreed upon as limiting the expenditure into weeks of the period under review, it is then possible to regulate the expenditure so that profits are possible. Indiscriminate spending without reference to production will irregularise profit.

Weekly returns, made up from the works-records which are possible under control-of-procedure-and-authority, enables the management to review the expenditure in relation to the pre-determined standard laid down. Control-of-expenditure is the science of industrial arrangement in relation to total-value-of-sales. In short the ability to hold in check the fluctuating indirect-expenditure, in accordance with pre-determined percentage of direct expenses.

Control of Labour.

Control of labour is the physiological study of the industry, for it will be conceded that, so far as the mechanical side of production is concerned, it is the desire of all industrialists to have the best plant, and to obtain from it as near the maximum as possible. If so much attention is paid to the mechanical element of production, it is equally important that one gives the same attention to the physical element. In large concerns, it is possible to maintain history record cards of all employees, and to appoint some person to have the engagement of new starters, the smaller concern cannot give it the same attention, but fundamentally the same care should be exercised in labour control. There is the junior and senior labour. The junior is the potential profit-earning element living in the environment of the foundry industry and being modelled according to its standards. Amongst the senior labour one may have all types of individuals, and it will be suggested that they are the best obtainable. One has to satisfy himself of the accuracy of the statement. Officers should be selected from the best type of workmen, men who will always maintain a firm control over their labour to the highest standard obtainable.

The development of labour-control-methods may be studied in conjunction with well-known writers upon this subject, and the book on Scientific Management by W. F. Taylor is well worthy of attention.

Pre-Determination of Costs and Comparison with Actual Cost of Production.

This subject is approached from the position when the order or inquiry is received. From existing records, or other instruments of measurement, one sets against each item the allowance in labour and material-cost. There remains to be added the percentage for indirect-expenditure or overhead. This is passed to the management, a copy being retained by the works accountant as the standard cost of manufacture. The work is put in hand by means of the works order, and finally the cost record of actual expenditure is set out alongside the several details laid down in the original specification and cost estimate. Every job should be made to pay, and information is of no value which is produced weeks after the completion of the job. Records should be entered speedily so that the management may know very quickly just what the position is.

The question arises, "Should every job be treated individually and an estimated cost produced for each?" It is obvious that this depends upon many conditions. The foundry engaged upon repetition work is very largely on piecework, and once the cost per piece is obtained it can only vary according to material cost, and percentage of reduction in cost of indirect expenditure. In those foundries where the product is variable individual-cost-estimates are essential.

The accounting returns, together with the statistical returns, are the photographic record of actual operations. Their object is to bring before the management the true record and story of all activities. No part of this information can be available without an internal method of accounting and collection of detail. *This is works accounting.*

It is for the founder to decide to what limits the work of recording shall be carried out. The works accountant will give a full and complete report of what is primarily essential for actual accounting details, and that which is essential for statistical information. He will also provide an estimate of his departmental cost in bringing the system into effect, and possible cost of its continuance when all details are effective. Give to the works accountant as much help as possible, and the works accountant will reciprocate with information designed so as to enable one to effect economies and greater control. Control is the keynote of the foundry industry, and it is made possible by the co-operation of its executives and the works accountant.

VOTE OF THANKS.

Mr. Makemson, in moving a vote of thanks to Mr. Gray, said the lecturer had not described any particular system of accounting, but had dealt with the subject in a general way, explaining the principles on which a system should be based. He understood the West Riding members discussed the subject at a meeting held about a month ago, so they at any rate should be thoroughly alive to the necessity for cost accounting in the foundry. Unfortunately in many foundries the management were not alive to it, and in these days of keen competition the lack of a reliable costing system led some of them to quote prices which were not remunerative, but they did not always realise the fact until it was too late. Sooner or later that sort of thing was bound to have a disastrous result. So foundries must be careful in costing and ascertain what jobs were losing money and what jobs were yielding profit. Mr. Gray had put forward a plea for a standard costing system. That had been introduced in Germany. He supposed it was more or less elastic, but fundamentally it was on a standard basis. Similar action would probably be found to be desirable in this country sooner or later.

In seconding the vote of thanks, Mr. R. W. Stubbs said, according to Mr. Gray's system, accounting seemed to be a very complicated business, particularly so if one was concerned with a small foundry; and the establishment of a standard system, if such a thing were possible, would do a great service. Many foremen did not realise the importance of taking times accurately. Ask one of them how long a casting was going to take, and often in the time he estimated he was not to half an hour. When that happened and half a dozen castings had to be made on the job, it materially altered matters.

What depreciation would Mr. Gray put upon pig-iron which was bought three years ago and had since been kept in the yard? Should it be taken at the price it was bought at or the market price of the day? To what account would Mr. Gray carry renewals, repairs and maintenance?

The vote of thanks was passed unanimously.

Mr. Gray said the Government had decided what used to be a very vexed question by saying raw products must be taken in at the market price or the purchase price, whichever was the lower. In most foundries there was some confusion about the repairs, renewals and maintenance. He thought the proper definition would be this. Where the expenditure was on account of existing plant and equipment it must be borne by the operating section which received the benefit of the service. Where the expenditure created something additional to the existing plant and equipment it would be dealt with by the chief accountant and the works manager as capital (plant) addition. The repairs and renewals account should always be the account controlling repairs as indirect expenditure.

DISCUSSION.

Mr. J. Hogg said quite a number of foundries accepted orders for castings at an all-round price of so much per cwt. During a period they would execute at that price all the orders which came from a firm of engineers. He understood Mr. Gray to say that every job ought to stand on its own basis and make a profit, and he wondered whether Mr. Gray had heard of that practice, and whether he considered it a satisfactory one.

Control of Flat-Rate Price per Cwt.

Mr. Gray said it was his experience that in the operation of a flat rate the founder took into consideration the class of the product or the section in which he would place the business for which he was quoting. He safeguarded himself by distinguishing between heavy medium and light castings. If he took the whole at a flat rate he might win or he might lose. It was not a sound commercial proposition unless there was something to go upon, some experience of previous years. Where an average could be taken on orders received from the same firm for years before, and where the buyer was constantly using the same class of products, one would be quite safe in quoting a flat rate; but it was difficult to apply the flat rate to all industries, particularly where the products varied.

In such a case costs would be kept by a control number. Everything for that firm would be debited to that number. All the receipts (the total value of the sales at the flat rate) would be credited to that number. Then, by comparing the total manufacturing cost or the total cost of production with the total value of the sales one could see whether he was making or losing money. He did not think it was possible to be sure every job would make a profit. Where the foundry in a large concern did jobs for people outside it was the practice, in his experience, to leave the question of price to the cost accountant and foundry management. They were expert enough to say they would do the job for a certain sum of money. Afterwards the pre-determined price was compared with the actual cost, and if a loss was made it was shown under a special account as a foundry trading loss.

Costing of Waster Castings.

Mr. A. Sutcliffe asked whether to estimate from a drawing was not just guesswork in many cases. It was surely better to give a price and time from the pattern. Where special tackle was needed for a job and was scrapped when the job was finished, what should be done about it? Should it be charged to the job? The customer was buying the casting, not the tackle. In estimating a foundryman would take into account labour, core making, moulding, fettling. But one workman was not as good as another in speed or quality of output. Some used twice as much material in the way of sprigs, facing sand and the odds and ends connected with a job. A previous speaker had complained that a foreman could not give the time for a job to half an hour. Was there any foreman present who would undertake to do so? He himself would not. Give one type of job to a man and he might be two hours behind, or even a day behind. He had seen them more; but this did not say the foreman was wrong in his time given. All foundrymen had wasters, and they were of two kinds—those for which the workman was responsible, those for which the management were responsible. Thus was it suggested each job should stand by itself, or that the good castings should pay for the bad? If three or four had to be made in order to get two, what would be done about the wasters? Would another customer be made to pay for the bad ones?

Paying for Patterns.

Mr. Gray said he did not think an estimate from a drawing was either a gamble or a guess. In his opinion a proficient foundryman ought to be able, within limits, to take out his quantities from a drawing very accurately. If a foundry had not the tackle required for a job that order ought not to have come to the foundry. However, if special tackle was made it was an addition to the foundry equipment, and, therefore, an asset which would be depreciated year by year until it was broken up and put back into the cupola. Should the cost of such tackle be put to the job? That was a very important point, and was usually decided by the management. His advice always had been that according to the estimate of the use which could be made of the tackle it could be reserved as an asset value; the remaining portion of the cost would be borne by the pre-determination of the cost of the job.

Wherever the human element came in there would be wasters. The costing accountant would see to it that the wasters were properly recorded against the particular job, and would report to the foundry manager with the percentage worked out. After due inquiry into the making of the casting that percentage became more or less standard, and affected cost of production. Apart from the human element certain castings were most difficult to produce and there was bound to be trouble. But one thing which must control the pre-determination of the cost of such a job would be the regular review of the effect of wasters, and the cost would be borne equally by all. It was invariably determined by the management. Some would say that it should be charged as a ratio overhead on the good castings produced; others would say that it should be charged direct to the job. The main point was that it was the operation of the foundry as a whole, not of any particular section, which came out statistically in the accounts. These things came out afterwards as percentages shown on the whole, and as that percentage rose and fell so was the efficiency of the foundry made manifest.

XUM

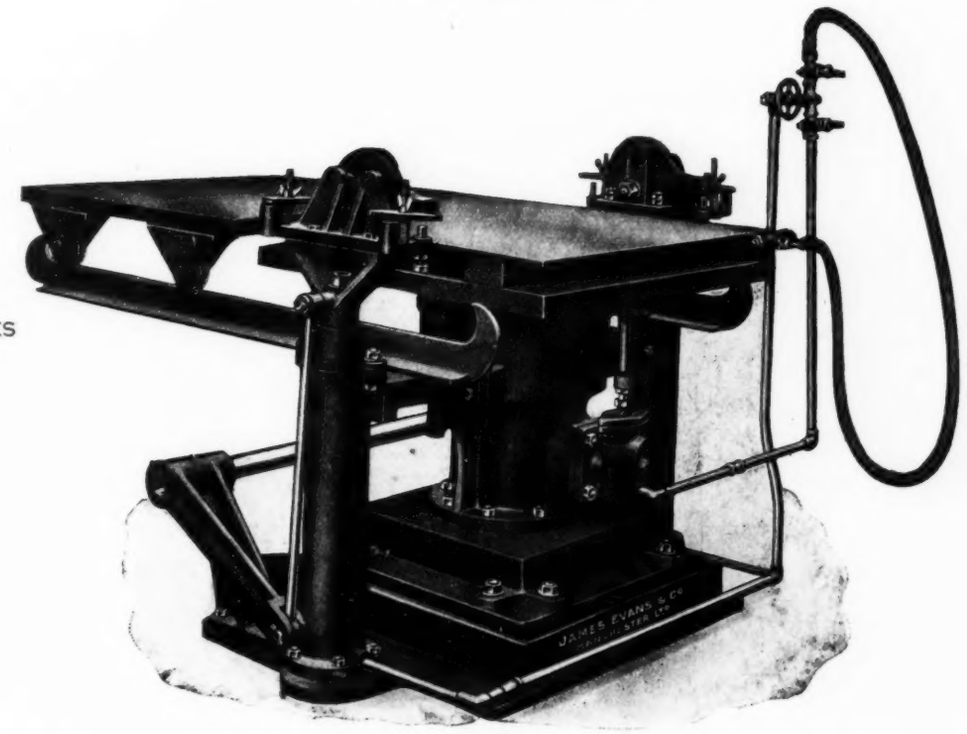
TYPE "C"

JAR RAM MOULDING MACHINE

with Turnover Pattern Plate.

For Pneumatic Power.

TWO MACHINES IN ONE.



UNSKILLED LABOUR ONLY REQUIRED.

The above machine illustrates a Jar Ram Machine with Turnover Pattern Plate which can also be used for Stripping Plate Work.

The machine has been designed to combine the two distinct features above mentioned, and is practically two machines in one, equally suitable for steel, iron, etc.

The machine as illustrated is arranged for work that requires turning over, such as steel moulding. And while the turnover arrangements are intended for general repetition work, by detaching the turnover plate from the trunnion brackets the machine can be used for stripping plate work by attaching the stripping plate to the trunnion brackets. Or, on the other hand, by removing the trunnion brackets as well, the table can be used for jolting general jobbing work.

A very important feature of the machine is the simplicity with which the intensity of the Jolt can be regulated when the operator has become accustomed to the use of the machine, which takes but an hour or so. The valves all being on the exterior of the machine are easily accessible, and there is an adjustable arrangement that will allow the jolt to be varied between 1½ in. to below ¼ in. This being done without disturbing any part of the machine.

The machine is supplied with Withdrawal Carriage, Vibrator, and Blow-off Nozzle complete. It is substantially constructed to stand heavy wear and tear, and requires a minimum amount of skill to operate.

Another important feature of the machine is in the arrangement of the hard wood anvil block for receiving the shock. The blocks being carried well down the machine in a specially designed annular chamber give considerable relief to the foundations. It also provides against the possibility of fracturing the jolting table. Pitch pine blocks are also inserted between the foundation plate and the machine bedplate to assist in the relief on the foundations, and these features considerably improve the working advantages of the machine.

IT IS ALSO ENTIRELY OF BRITISH DESIGN AND MANUFACTURE.

JAMES EVANS & CO. (M/c) LTD.

Britannia Works, BLACKFRIARS, MANCHESTER.

Replying to a question whether patterns should be paid for out of revenue or depreciated, Mr. Gray said in his opinion it was wrong to depreciate patterns upon a fixed value; the actual cost of repairs and renewals might be considerably more. It was far better to pay for patterns out of revenue and leave depreciation alone.

Unremunerate Orders and Lowering Overheads.

Mr. W. H. Poole said he was sorry the lecturer had not outlined some simple scheme suitable for a jobbing foundry. One could readily see it was possible to do so, working out the principles which had been so lucidly explained. Evidently Mr. Gray was enthusiastic about the importance of proper costing in a foundry, and it was regrettable that the foundry industry had been sadly lacking in that respect. Generally speaking, it was a question of waiting till the end of the year to see what had happened.

In order to ease the burden of overhead charges a certain amount of work could be taken at a price which would cover bare cost. Although a definite profit was not made on such a job it lessened the incidence of the overhead charges on the rest of the work. But to what limit could a foundry go in that way, especially when it was taking work in at an all-round figure? In some cases it was a true gamble.

Mr. Gray said the question whether orders should be accepted at manufacturing cost was troubling many firms at the present time. Suppose a factory was equipped for an output of 100 tons per week and only had orders for 30 tons per week. It would be working at a loss. The profits on the profitable jobs would be swallowed up by the many charges. If orders were accepted at the manufacturing cost of production some part of the overhead charges was accounted for. It was the province of the management to say how far they could go in that direction. When the production was only 25 per cent. of the maximum it was very hard to refuse an order of that kind; a firm was inclined to say "We can only increase our output by accepting orders at manufacturing cost, and that will enable us to pay part of our charges." Economically such action was wrong. In nine cases out of ten the customer received a benefit which he did not pass on, and when a repeat order came along he wanted that to be at the same price. The problem could only be solved by the management; it was not part of the function of a cost or works accountant, who was merely an adviser.

Mr. J. Devereux said there was no doubt the problem how to keep their works at full employment was troubling many firms to-day; people did not appreciate sufficiently the extent to which manufacturers were producing at just what it cost them. Fixed charges did not vary. If they amounted to £20 for a production of £100 and the production fell to £40 there must be some loss. Then if the production was raised to £100 by accepting orders at rates which just cleared expenses there was more likelihood of profit at the end of the year. The tendency to lower prices was governed by the laws of supply and demand. If a manufacturer was slack and he knew his competitors were in the same position he would quote a low price. When a busy period came and everybody had plenty of orders prices rose. That, he thought, answered the point that a customer would expect a repeat order to be taken at the same figure. It depended on whether the industry was busy or otherwise.

Mr. R. D. Welford, on behalf of the members of the West Riding Branch, expressed their pleasure in being present and hearing such a comprehensive Paper read by Mr. Gray. It had advanced what all present would feel were irrefutable arguments for the economic necessity of cost accounting as a factor in producing successful results, but it did not follow that the installation of a system of cost accounting would result in a profit being made. Hearing Mr. Grays' Paper might produce the impression in the minds of foundrymen that another cost system would have to be instituted. It was also a fact that some large manufacturing concerns who had super-efficient costing systems had incurred losses running into millions, so that efficient management was the main factor. In the foundry industry small shops were in the majority, and they wanted a simplified system of cost accounting. To his mind the crux of the Paper was the statement that a standardised system was necessary. In that connection Mr. Makemson had mentioned Germany, but they could come much nearer home. An important association of foundry owners in Great Britain had a standard system which was applied to all their members. The consideration of the necessity for a system of costing in the foundry or any industry, he thought, was more in the province of an Employers' Association than of an educational corporation such as the Institute of British Foundrymen. It was certainly true that the subject was discussed at the West Riding Branch meeting a month ago, but they had in mind a simplified system which could be applied to small foundries and provide a basis for future estimates of costs, besides enabling them to know whether they were making a profit or not. He thought such a system could be reduced to four main heads: cost of metal, cost of general materials, labour, and overhead charges. He would only raise one point: What would be done about scrap? A foundry producing 75 tons of castings per week would melt probably 100 tons of metal. Would a job be charged only with the weight of metal in the casting or with that weight plus one quarter for scrap? Would the scrap be at scrap price or melted metal price? That question cropped up constantly. Personally he thought the best course was to take the weight of the metal in the casting and add the quarter for extra metal as scrap, such as runners, risers, and feeding heads, less the difference between the melted metal cost and the scrap value, or, in other words, charge the cost of melting the extra 25 per cent.

Returned Scrap Charges.

Mr. Gray said in many industries there were what was known as materials in cycle. To produce a certain quantity of saleable product a certain quantity of material must be used. Working it out statistically in the returns, the castings produced would be given as a percentage of the metal melted; the difference between the two represented the loss and scrap returns. The rise and fall of that was one of the statistical records of the melting efficiency. Wasters were separated from the returned scrap which resulted from moulding. That percentage of scrap would always be shown on the weekly returns. Once the percentage was ascertained there was no difficulty in estimating the cost of castings, because over a period the material in cycle did not vary much; it was consistent in quantity. If the average was graphed out over a period it would be found to be remarkably steady.

Attached and Detached Foundry Costing.

The Chairman (Mr. E. Longden) remarked that he thought Mr. Gray had not quite understood the previous question. Some loss occurred in melting and handling. How was that dealt with? Could Mr. Gray give further illustration of the practicability of standardisation of accounts for the foundry industry? Standardisation of products had been mentioned. What was the peculiar advantage of that in relation to management? A foundry which manufactured castings for an engineering works would bear certain overhead charges which a jobbing foundry would not bear. There were commercial and other charges. Suppose the two were in competition for a job. How would Mr. Gray assess the overhead charges of the engineering foundry which also manufactured for outside firms? Evidently it would not be fair to place the burden of all the overhead charges of an engineering firm on the foundry which was in competition with the jobbing foundries which did not bear the same charges.

Competition and Departmental Costing.

Mr. Gray replied that metal returned from the cupola would be charged back to the scrap account, and the products resulting would be taken at the average cost of the metal produced. Standardisation of accounts served this purpose, as everybody would be consistent. They knew from an examination of their chart exactly where the expenditure was going; and the costing accountant could manipulate the records and average them more readily. What was the use of standardisation of products? In some cases workmen, in their requisitions, rarely gave the proper name to an article; they gave it their own designations. One might speak of a mallet, another of a hammer. When these requisitions got to the accounting staff the person who handled them was usually a clerk without technical training. He might charge something which he should not charge and *vice-versa*. If there was standardisation the storeman who took the requisition would say, "This is N.249," and he would put down N.249 on the requisition and post it up in his records.

A foundry in an engineering works, making products which are passed through the works, should bear that proportion of the administrative expenses which in the ordinary routine each product should bear in the ratio at which it proceeded from one operation to another. It was brought into the composite machine at a cost when commercial expenses, directors' fees and so forth were added. But the position was different when it was in competition with a jobbing foundry. In both cases the prime cost of manufacture should be considered. Only the direct departmental and operating expenses should be taken into consideration, and no part of the selling organisation, no part of the overhead charges not directly concerned with the production, should be surcharged upon the product. Otherwise the business would go out of existence.

When circumstances arose such as described it was always essential to consider both agents equitably. In this way the various elements of manufacture were more in line with each other, and there was more likelihood of obtaining the order than by surcharging the job with overheads which were only very vaguely concerned in its manufacture.

North-East Coast Exhibition.

We understand that excellent progress is being made with the construction of the North-East Coast Exhibition at Newcastle-on-Tyne, which is to be opened on May 14 by H.R.H. the Prince of Wales. Occupying some 106 acres on the Town Moor, within easy reach of the heart of the city, the Exhibition gives every promise of being a great success. One of the objects the promoters have in view in holding the exposition is a strong effort to stimulate the revival of trade on the North-East Coast, which has suffered so much in recent years from commercial depression. Whether this will be achieved or not is a matter which cannot be answered at the moment, but there is a feeling of hopefulness that a degree of prosperity will accrue.

The two main buildings which are to house the principal exhibits—the Palace of Industries and the Palace of Engineering—are complete. The exhibitors are now in possession of the former building, and once the concrete foundations are laid for the heavy machinery the engineering exhibits will begin to arrive. The Exhibition will be fully representative of the numerous industries which have made the North-East Coast famous throughout the world.

The Greenock Dockyard Company, Limited, Greenock, have obtained from the Clan Line Steamers, Limited, an order for a 10,000-ton cargo steamer.

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WHITE DUST,
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Trade Talk.

An order which will mean full-time employment for the tyre mills for at least twelve months has been obtained by the Blaenavon Company, Limited.

Operations were commenced recently at the new Pencoed Tinplate Works, Llanelly. For the present it is proposed to work only two mills, but a third will be put into commission in the course of a few weeks.

Rutherglen Dean of Guild Court have approved of plans and granted permission to Messrs. Stewarts & Lloyds, Limited, to make alterations and extensions to their Rutherglen works at a cost of several thousands of pounds.

On Clydeside 5,000 shipyard workers are involved in a ban on overtime ordered by the Amalgamated Society of Woodworkers on account of the employers' refusal to grant the joiners the advance of 3s. per week given to other shipyard workers some time ago.

A contract has been placed with Messrs. Craig, Taylor & Company, Limited, Stockton-on-Tees, for a coal-burning steamer of 7,600 tons for Messrs. W. E. Hinde & Company, Cardiff. The vessel is to be engined by Messrs. Blair & Company (1926), Limited, Stockton.

The Argentine Navigation Company (Nicholas Mihanovitch, Limited) have placed with Messrs. A. & J. Inglis, Limited Glasgow, an order for two twin-screw motor ships of about 1,500 tons gross. The engines will be provided by Messrs. Harland & Wolff, Limited.

The managing committee of the International Steel Cartel, which met in Brussels on March 14, decided to limit the annual production by 2,000,000 tons, as all countries participating in the Cartel had been forced by market requirements to exceed their present quota.

A blacksmith's hammerman, Thomas Shaw, received serious head and face injuries at Glengarnock Iron and Steel Works (Messrs. David Colville & Sons, Limited) through a piece of metal flying from the hammer and striking him. He was removed to the Glasgow Royal Infirmary.

Blackfriars Foundry Equipment Company, Limited, 34-35, Norfolk Street, London, W.C.2, have been appointed Southern selling agents for the Du-Ram patent steel moulding boxes and snap flasks made by Messrs. J. W. Sadler & Company, Limited, Bartle Lane, Great Horton, Bradford, Yorks.

A floating crane has been completed for the French Government, for work in the Suez Canal, by Messrs. Cowan, Sheldon & Company, Limited, Carlisle, at the Workington New Dock. The crane has a displacement of 2,000 tons, a jib 200 ft. in height from the water level, and a lifting capacity of between 150 and 180 tons.

The Stanton Ironworks Company, Limited, have been compelled to blow out a blast furnace in consequence of being unable to obtain the coke required. With heavy forward orders booked, the company state that, unless supplies of coke already purchased under contract are forthcoming, further furnaces must be blown out.

The North-East Coast Institution of Engineers and Shipbuilders have elected the following officers for the ensuing year:—President, Mr. Launcelot E. Smith; vice-presidents, Messrs. G. T. Edwards, R. J. Eyres, S. Hunter, W. J. Paulin, W. H. Waddington, and W. R. G. Whiting; hon. treasurer, Mr. R. H. Winstanley.

Messrs. Sir W. G. Armstrong, Whitworth & Company, Limited, have received an order from the Central Argentine Railway Company, Limited, for the construction of 20 heavy 4-8-4 locomotives. These engines, which will weigh in running order over 123 tons each, will be shipped in fully-erected condition, in accordance with the builder's usual practice.

There has been keen competition for the possession of the rack rails and wheels from the Wylam Wagon-Way, the earliest railroad in the world. However, they are now to find a permanent home in the London and North-Eastern Railway Museum, York, to whom they have been presented by Messrs. Thos. W. Ward, Limited, Sheffield, who are dismantling Spencer's Newburn Works, where the rails and wheels have been lying. Owing to the importance of the Railway Museum at York, this is the most fitting home for these relics, which date back to the year 1812.

At a meeting of the debenture holders of the Aluminium Corporation, Limited, held on March 11, approval was unanimously given to the sale of the hydro-electric portion of the undertaking to the North Wales Power Company, Limited. The ordinary and preference shareholders of the North Wales Company later in the day unanimously sanctioned the reduction of the capital from £1,000,000 to £808,058 10s. by writing off 10s. per £1 ordinary share; and the sub-division and conversion of the £1 preference into ordinary shares of 10s. each; the cancellation of arrears of preference dividend; and the increase of the capital to £1,000,000 in shares of 10s. each.

Details of new manufactures which have been taken up by Messrs. Vickers, Limited, were given by Mr. Alec Williamson at a function in Sheffield recently. They had been suffering, he said, from Continental competition in heavy forgings and had set out to prevent, as far as possible, foreign forgings coming into this country. They had obtained practically all the orders for the marine shaftings which had recently been placed in this country. They had taken up the manufacture of high-pressure boiler drums, and the firm had recently had orders for the biggest high-pressure boiler installation that had ever been erected in the British Empire. Further, they had undertaken the centrifugal casting of iron pipes and had met with success.

A consignment of seven trolley locomotives, designed and built by Messrs. Greenwood & Batley, Limited, Leeds, for the Chaokockwang coal mines, in China, are at present under test, and will be despatched shortly. The current intake is by pantograph, and there is a rail return circuit, the voltage being 550 d.c. Each of the two motors is rated at 20 h.p. The dimensions of the locomotives, 10 ft. 3 in. long by 2 ft. 9 in. wide, were determined by the size of the pit cages. Each locomotive has to draw a 60-ton train, say, 40 tubs of coal and five tubs of stone, and to exert a normal tractive effort of 2,000 lbs. at a speed of 6½ m.p.h. The maximum tractive effort actually developed on test is about 3,000 lbs., and the runaway speed does not exceed 11 m.p.h. Each locomotive weighs about 3½ tons without ballast, and ample room is provided for 30 cwts. of ballast. A four-wheel hand-brake is fitted, with balanced coupling.

Obituary.

Mr. Thomas Brook, founder of Messrs. T. Brook & Sons, Limited, engineers, of Huddersfield, has died at the age of 78 years.

Mr. J. R. Dixon, manager of the Newcastle office of the Scottish Tube Company, Limited, died suddenly in Newcastle-on-Tyne on March 11.

Mr. F. W. Harris, head of Messrs. F. W. Harris (Birmingham), Limited, scrap metal merchants, died at his residence in Birmingham recently.

Mr. William C. Pike, manager and local director of Messrs. Robert Thompson & Sons, Limited, shipbuilders and repairers, Sunderland, died on Saturday of last week, aged 63 years.

We regret to announce the death, last Monday, of Miss Freda Lake, the second daughter of Mr. W. B. Lake, J.P., managing director of Messrs. Lake & Ellcott, of Braintree, and chairman of the London Section of the Institute of British Foundrymen.

Angus Wright, an apprentice in Messrs. John Brown & Company, Limited, Clydebank, whilst at work on a platform, was dragged off by the travelling crane. In his fall his head struck a lump of metal, his skull was fractured and death instantaneous.

Mr. C. W. Robson, iron and steel merchant, of Villiers Street, Sunderland, died in Edinburgh recently. Mr. Robson, who was 50 years of age, was at one time with Messrs. Redhead & Ingham, iron and steel merchants, of Sunderland, and started in business on his own account about 26 years ago.

The death has occurred of Mr. John Henry Pedley, one of the best-known men among the employees in the Derbyshire foundry trade. The deceased began work at Smith's Brass Foundry, and remained there until he was 60 years of age. He lived at Barrow-on-Trent, and was 84 years old.

We regret to announce that Mr. Charles Stanley, general manager of the Birmingham section of the British Industries Fair, was found dead last Monday at his home at Alcester, lying near a stove from which gas was escaping. Mr. Stanley lost his father only a week or two ago, and his wife is in a nursing home following an operation. He himself had only just recovered from an attack of influenza, and last week was again obliged to take to his bed. It had been decided that an operation was necessary. Mr. Stanley, it will be recalled, organised foundry trade exhibitions in Birmingham in 1922 and 1924.

Contracts Open.

Manchester.—150 cast-iron pillars, 15 ft. to 17 ft., for the Parks and Cemeteries Committee. The General Superintendent, 38-40, Lloyd Street, Albert Square, Manchester.

Blackpool, March 27.—Two electrically-driven vertical-spindle centrifugal or axial-flow sewage pumps, for the Corporation. Mr. F. Wood, borough engineer and surveyor, Municipal Buildings, Town Hall Street, Blackpool.

Cairo, May 1.—Diesel engine, air compressors, cooling water circulating system, etc., for the Egyptian Ministry of Public Works. The Department of Overseas Trade. (Reference A.X. 7632.)

Portsmouth, March 27.—Weighbridge, capacity 20 tons, and one lever weighing machine with scoop, for the Board of Guardians. Mr. W. E. Godfrey, clerk, 1, St. Michael's Road, Portsmouth.

Personal.

Mr. A. E. Hurst, of Messrs. Samuel Russell & Company, Limited, ironfounders, of Northcote Street, Walsall, has been appointed a Justice of the Peace for the Borough of Walsall.

Mr. Frank G. Young, B.Sc., who has been Director of Education and Executive Officer for Orkney Educational Authority, has been appointed Principal of Dundee Technical College, in succession to Dr. Lumsden, who is retiring shortly.

Mr. F. S. O'Neill, manager of the Indianapolis plant of the Link Belt Company, Chicago, has been elected president of the Indianapolis Foundrymen's Association. Mr. G. E. Street (vice-president), Mr. J. H. Hooper (treasurer), and A. J. Allen (secretary) continue in the same capacities.

Mr. William Jenkins, who has been for some considerable time in the employ of the Steel Company of Scotland at their Hallside Foundry, was recently given a presentation by the workers and staff on the occasion of his leaving to take up an appointment with Messrs. William Beardmore & Company, Limited, Parkhead.

Mr. Karl H. Marsh, chief engineer at the Buffalo plant of the Wickwire Spencer Steel Company, Inc., New York, has resigned to become identified in a similar capacity with the British Empire Steel Corporation, with headquarters at Sydney, N.S. Mr. Marsh served as chief engineer of the Dominion Steel Corporation, a subsidiary of the British Empire Company, from 1919 to 1923.

Wills.

Richards, L. G., of The Uplands, Saltford, Somerset, ironfounder £10,559

Cheeswright, F. R., of Bexhill-on-Sea, a past-Master of the Cutlers' Company £26,974

Kenton, W., of Churchfield Street, Dudley, manager and secretary of Messrs. J. & J. Whitehouse, Phœnix Foundry, Dudley £5,142

Stewart, A. F., managing director of Messrs. Jessop & Company, Limited, engineers and metal merchants, London and Calcutta £66,626

New Companies.

Metal and Iron Corporation, Limited, 45, Fore Street, London, E.C.—Capital £20,000. Director: K. F. Herrmann.

Port Talbot Steel Company, Limited.—Capital £100. Directors, etc., as for Black Mountain Silica Company, Limited, *q.v.*

Cast-Iron Supplies, Limited, 83-85, Albion House, 59, New Oxford Street, London, W.—Capital £1,000. Director: I. T. Bell.

British Steel Corporation, Limited.—Capital £100, in £1 shares. Directors and address as for Black Mountain Silica Company, Limited, *q.v.*

Standard Steel Company (1929), Limited, 72, Purley Way, Croydon.—Capital £25,000. Directors: F. Baxter, J. A. Morgan and H. Needham.

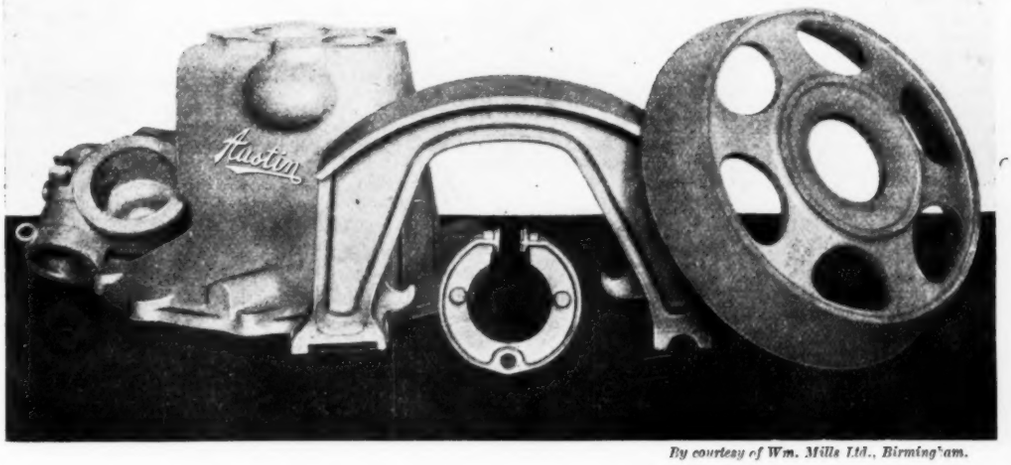
Whittaker Hall & Company (1929), Limited, Vulcan Ironworks, Burnley.—Capital £4,000. Engineers, etc. Directors: J. Stanworth, W. Dutton and O. Ashworth.

Black Mountain Silica Company, Limited, Baldwin House, Great Trinity Lane, London, E.C.—Capital £100 in £1 shares. Directors: E. W. Payton, P. G. Jones, Col. Sir William C. Wright, Bt., Col. J. B. Neilson and C. P. Jones.

F.T.J.21.3.29

for Lightness & Easy Machining

Four of the castings illustrated are in British Standard aluminium alloys and one in modified aluminium-silicon alloy. All except the clutch cone (an instance of clean sand-casting) were die-cast. All reducing weight and machining charges



By courtesy of Wm. Mills Ltd., Birmingham.

Aluminium Alloys

The British Aluminium Co., Ltd., Aluminium Producers, Adelaide House, London, E.C.4.

WARNER'S CYLINDER PIG IRON

BRAND "WARNER C.B.R."

THE WORLD'S BEST

WARNER & CO. LTD.
CARGO FLEET,
MIDDLESBROUGH ON TEES.

As supplied to the leading....
RAILWAY COMPANIES, LOCOMOTIVE, DIESEL and OIL ENGINE BUILDERS.
Also unequalled for
AUTOMOBILE CYLINDER BLOCKS, COMPRESSORS, ENGINEERS' TOUGH CASTINGS and CHILLED ROLLS.

TELEGRAMS:
REFINERY MIDDLESBROUGH.

ALSO MAKERS OF
HIGH CLASS REFINED PIG IRON
IN SMALL PIGS, FOR ALL KINDS OF
MALLEABLE CASTINGS

TELEPHONE:
MIDDLESBROUGH 4265.

Iron and Steel Markets.

Pig-Iron.

MIDDLESBROUGH.—The steady improvement already reported in the Cleveland iron outlook continues unchecked, and with the stabilisation of prices, which so far remain unaffected by the rise recently announced in quotations by the leading Midland furnaces, and the advancing costs of raw material, Tees-side makers are enabled to hold their own, notwithstanding outside competition. Whether Cleveland will be able to resist the upward movement remains to be seen, but the makers are already reaping the benefit of their restraint. It is understood that the Light Castings Association in Scotland have placed the whole of their contract for the next six months with the Cleveland makers. At any rate, in all directions consumption and demand are expanding, and a much heavier output could be disposed of. At the beginning of the year there were only 31 blast furnaces operating on the North-East Coast, and sales hardly kept pace with output; now 36 are in blast, and they are not sufficient to meet all current needs. Apart from the better home consumption, there is an improving demand from foreign consumers. Prices are still unaltered, as follow:—No. 1 Cleveland foundry iron, 69s. 6d. per ton; No. 3 G.M.B., 67s.; No. 4 foundry, 66s.; No. 4 forge iron, 65s. 6d. per ton.

In the market for East Coast hematite, also, substantial orders are again reported, most of the business being for April-May delivery, makers finding it difficult to accept prompt commitments except for small quantities. Prices, however, vary. As much as 74s. has been paid, but 73s. 6d. per ton may be regarded as a current market price for mixed numbers and 74s. for No. 1 quality. On the North-West Coast Bessemer mixed numbers are quoted at 74s. per ton at works, with low-phosphorus iron at 2s. 6d. to 5s. per ton above that figure.

LANCASHIRE.—As noted in previous reports, the upward tendency of prices as concerns the chief Midland furnaces has now culminated in a general advance in quotations throughout this area. F.o.r. prices on local markets have been abolished and quotations are now on a delivery basis, varying according to specified zones. A week ago Derbyshire No. 3 iron for delivery Manchester or equal was quoted at 70s. 6d. per ton, with Staffordshire brands at about 72s. 6d. Under the new scheme, quotations are now 71s. and 73s. 6d. per ton respectively, the basic price of Staffordshire iron having been fixed at 2s. 6d. more than Derbyshire. The highest delivered rate for Derbyshire iron to Lancashire buyers is 73s., this price applying, for example, to consumers in Preston and Blackburn. Scottish brands are also firmer at about 90s. per ton, delivered locally.

THE MIDLANDS.—Similar measures as regards foundry pig prices have also been fixed to operate in this area, the figures given including delivery to stations in the Black Country group, with 7d. per ton extra if delivered into works in 10-ton lots:—Derbyshire No. 3, 72s. 6d.; Staffordshire No. 3, 75s.; Northants No. 3, 69s.

SCOTLAND.—Business in the Scottish markets for pig-iron is still exceedingly quiet, and the few furnaces in blast are more than adequate to cover consumers' requirements. The basis price of 72s. 6d. for No. 3 foundry at the furnaces is unaltered, and the new arrangement seems rather to hamper dealings than to facilitate them. The light-castings founders are not any busier, and their requirements of pig-iron are easily filled.

Finished Iron.

The manufacturing branches of the trade continue quiet, and in the Black Country the position in this market is to all intents and purposes without change. In the last two or three weeks there has been a little more activity in the demand for crown iron, and higher prices are being asked. The higher figures may be attributed to the increased cost of raw material, as forge pig-iron is considerably dearer than it was a month ago. At the present moment Staffordshire crown iron quotations are from £9 5s. to £9 15s., ordinary £9 5s., nut and bolt iron £8 15s. to £9, and marked bars £12 per ton, f.o.t.

Steel.

At Sheffield, at the moment, the market for steel and semi-products is increasingly firmer than of late, and business is moderately active. The sale of basic billets is on a large scale, and with the prices of Continental material on about the same level as those for home-produced billets, the tonnage of imported material is decreasing rapidly. Soft qualities are the feature, but hard are beginning to develop again. Siemens acid billets, in which there is a free market, indicate a little improvement. Quotations:—Basic billets, soft, £6 17s. 6d. to £7; semi-hard, £7 5s.; medium, £7 15s.; hard, £8 15s.; Siemens acid, £8 15s. to £9; steel hoops, £9 5s. to £9 10s. Wire rods, soft basic, £7 15s. to £7 17s. 6d.; medium hard, £9 2s. 6d.; hard, £10 5s.; acid, £12. In the tinplate market, current quotations for coke qualities rule at 18s. to 18s. 3d. basis, net cash, f.o.b. Welsh ports.

Scrap.

Markets for all descriptions of cast scrap materials are becoming weekly more active, and in Scotland, where there is some scarcity, prices are tending to advance, machinery quality now being quoted at 72s. 6d. to 75s., with ordinary 65s. to 67s. 6d., with old railway chairs 70s., all per ton delivered works. At Birmingham this week cast-iron scrap was firm, and 70s. delivered was quoted for heavy machinery cast-iron scrap in cupola sizes, light cast-iron scrap realising 55s. delivered. On the North-East Coast the foundries are not heavy consumers of ordinary cast-iron scrap, and they are able to buy at 62s. 6d. per ton, but up to 66s. has been paid for machinery quality in handy sizes.

Metals.

Copper.—The steady upward trend of warrant copper values noted in recent markets made a sensational jump at the week-end close, when £90 10s. was recorded, and prices have continued to rise during the current week. The movement is attributable to heavy buying by Continental and American interests, and in the opinion of market experts the metal has not yet reached its ultimate level.

Closing quotations are:—

Cash.—Thursday, £86 10s. to £86 12s. 6d.; Friday, £90 5s. to £90 10s.; Monday, £97 10s. to £97 12s. 6d.; Tuesday, £94 to £94 2s. 6d.; Wednesday, £96 5s. to £96 7s. 6d.

Three Months.—Thursday, £87 17s. 6d. to £88; Friday, £91 15s. to £91 17s. 6d.; Monday, £98 17s. 6d. to £99; Tuesday, £95 7s. 6d. to £95 10s.; Wednesday, £97 10s. to £97 15s.

Tin.—In striking contrast to its neighbouring section, the position in standard tin is singularly flat at round about £220 and even lower values for cash, and this notwithstanding favourable reports from the South Wales tinplate works and the figures of American consumption. With regard to the future, the position has become more obscure than ever. The market is purely an artificial one, and whereas in the past the presence of group support to prevent values from falling below £220 could be relied upon with a certain measure of certainty, this feeling is by no means as freely expressed now.

Official closing prices:—

Cash.—Thursday, £220 to £220 2s. 6d.; Friday, £221 15s. to £221 17s. 6d.; Monday, £223 to £223 2s. 6d.; Tuesday, £224 17s. 6d. to £225; Wednesday, £222 15s. to £223.

Three Months. — Thursday, £219 10s. to £219 12s. 6d.; Friday, £221 to £221 5s.; Monday, £223 to £223 5s.; Tuesday, £225 10s. to £225 15s.; Wednesday, £223 15s. to £224.

Spelter.—The tone of the spelter market recently has been a little more confident, and inquiries of late have been rather more numerous, but on the other hand it must be remembered that the position on the Continent with regard to transport should be much improved in the near future.

Daily quotations are:—

Ordinary.—Thursday, £26 12s. 6d.; Friday, £26 17s. 6d.; Monday, £29; Tuesday, £27 17s. 6d.; Wednesday, £28 6s. 3d.

Lead.—The market for soft foreign has been rather erratic of late, with a good deal of speculative buying, although consumers appear to be holding off for the time being. The main strength of the position is still in America, and with regard to the future it is to be noted that all supplies coming on to the market are readily absorbed.

Prices have been:—

Soft Foreign Prompt.—Thursday, £23 13s. 9d.; Friday, £24 1s. 3d.; Monday, nominal; Tuesday, nominal; Wednesday, £27 16s. 3d.

Reports and Dividends.

Hadfields, Limited.—Dividend of 2½ per cent., less tax.

Scottish Tube Company, Limited.—No dividend on the ordinary shares.

John Baker & Company (Rotherham) (1920), Limited.—Dividend of 5 per cent. on the ordinary shares.

Vickers, Limited.—Dividend for 1928, at the rate of 8 per cent. per annum, less tax, on the ordinary shares.

Yorkshire Engine Company, Limited.—Loss, £2,583; brought in, £10,837; carried forward, after paying preference dividend, £7,053.

Walkers, Parker & Company, Limited.—Net profit, £29,454; brought in, £59,085; final dividend of 7½ per cent., together with a bonus of 3d. per share, making 11¼ per cent., less tax, for the year; carried forward, £59,289.

North British Locomotive Company, Limited.—Loss, after providing £20,000 for depreciation, of £2,305; transferred from reserve, £50,000; dividend 2½ per cent., less tax, on the ordinary shares; carried forward, £317.

Swan, Hunter & Wigham Richardson, Limited.—Net profit, £183,437; brought in, £32,321; debenture interest, £13,741; sinking fund account, £1,000; dividends of 3 per cent. on the cumulative preference shares, making 6 per cent., and of 4½ per cent. on the ordinary shares, making 7½ per cent.; carried forward, £25,296.

Stewarts & Lloyds, Limited.—Profit, £582,000, including the surplus of £133,000 on the liquidation of Stewarts & Lloyds (South Africa), Limited; set aside for depreciation, £175,000; payment on the deferred shares, after meeting the preference and preferred ordinary dividends, of 1s. per share, less tax; to reserve, £140,000; carried forward, £122,500.

Coltness Iron Company, Limited.—The directors have recommended the payment of an interim dividend on the ordinary shares of 2½ per cent., less tax, making a total for the year of 5 per cent. for the year ended December 31, 1928. A sum of £45,000 is placed to redemption and depreciation account, and £118,512 is carried forward. Last year the dividend was 10 per cent.

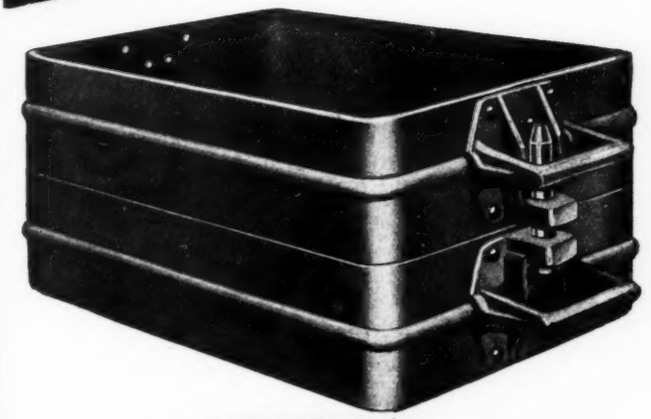
English Steel Corporation.

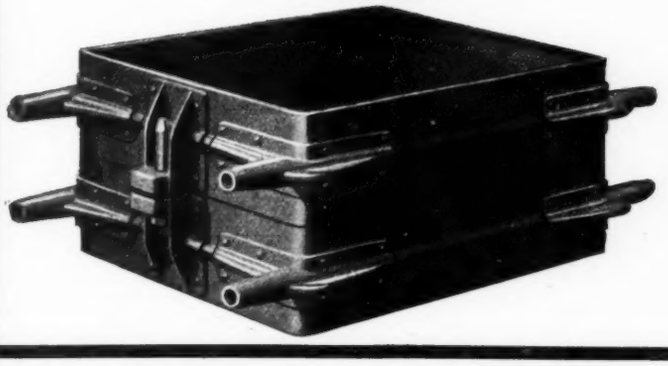
It is officially announced that the board of the English Steel Corporation, Limited, has now been constituted as follows:—Mr. G. R. T. Taylor (deputy chairman), General Sir J. F. Noel Birch, Commander C. W. Craven, Mr. W. L. Hichens, Mr. T. L. Taylor, and Mr. R. Whitehead. Owing to his appointment as deputy chairman of the English Steel Corporation, Limited, Mr. G. R. T. Taylor has resigned his post of deputy chairman of Vickers-Armstrongs, Limited, but remains a director on the board of that company. Mr. G. G. Sim has been appointed deputy chairman of Vickers-Armstrongs, Limited, in place of Mr. Taylor. Commander C. W. Craven, R.N., is appointed managing director of the Vickers-Armstrongs shipyards and works at Barrow-in-Furness and Newcastle.

As already announced, the English Steel Corporation, Limited, was formed recently to take over certain works and plant from Vickers-Armstrongs, Limited, Vickers, Limited, and Cammell Laird & Company, Limited. It is expected that other firms will amalgamate with the Corporation, two companies mentioned in this connection being Messrs. Thomas Firth & Sons, Limited, and Messrs. John Brown & Company, Limited. Lord Aberconway, who is a director of both companies, stated recently that negotiations were proceeding between these firms and the English Steel Corporation. Negotiations have also been in progress with other interests.

Sterling

SOLID RIBBED ROLLED STEEL MOULDING BOXES





In every class of Foundry and in every Moulding Box service Sterling Rolled Steel Boxes soon show their marked superiority, not only in the better quality of work produced, but also in increased output per man per hour.

Cast iron Moulding Boxes, however well made, are liable to be cracked or broken at any moment. They are also excessively heavy. Heavy boxes slow down production, reduce the capacity of your foundry, and impose unnecessary fatigue on your moulders.

Boxes made from sheet metal are too flimsy to stand up to the heavy duties of general foundry service.

View the position from any angle, there is only one solution to your moulding box problems . . . the Sterling Rolled Steel Box, with the solid centre reinforcing rib and the two stiff sand-retaining ledges. They are light, easily handled, strong, rigid and durable. Cannot crack or break. Cannot distort or get out of truth. They are accurately made and guaranteed interchangeable.

Write at once for Catalogue No. 37, which shows some thirty different standard styles of boxes.

STERLING FOUNDRY SPECIALTIES LTD.

London Office:
13, VICTORIA STREET, S.W.1.

BEDFORD.

Telephone: 3345 BEDFORD.
Telegrams: "STERFLASK, BEDFORD."
Code: WESTERN UNION.

WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	96	5	0
Three months	97	10	0
Electrolytic	102	10	0
Tough	99	10	0
Best selected	100	0	0
Sheets	128	0	0
India	119	0	0
Wire bars	102	17	6
Do. April	102	17	6
Do. May	102	17	6
Ingot bars	102	17	6
H.C. wire rods	107	10	0
Off. av. cash, February	78	5	10½
Do. 3 mths., February	78	4	10⅝
Do., Sttlmnt., February	78	5	6
Do., Electro, February	83	18	4½
Do., B.S., February	81	18	1½
Aver. spot price, copper, Feb.	78	5	10⅛
Do. wire bars, February	84	6	0
Solid drawn tubes			16½d.
Brazed tubes			16½d.
Wire			11¼d.

BRASS.

Solid drawn tubes	13½d.
Brazed tubes	15½d.
Rods, drawn	13d.
Rods, extd. or rlld.	8d.
Sheets to 10 w.g.	12½d.
Wire	11½d.
Rolled metal	11⅝d.
Yellow metal rods	8d.
Do. 4 × 4 Squares	9d.
Do. 4 × 3 Sheets	9½d.

TIN.

	£	s.	d.
Standard cash	222	15	0
Three months	223	15	0
English	224	0	0
Bars	227	0	0
Straits	226	12	5
Australian	226	10	0
Eastern	227	0	0
Banca	227	17	6
Off. av. cash, February	223	4	8½
Do., 3 mths., February	224	3	11½
Do., Sttlmt., February	223	3	9
Aver. spot, February	223	4	8¼

SPELTER.

Ordinary	28	6	3
Remelted	27	0	0
Hard	22	5	0
Electro 99.9	31	15	0
English	28	10	0
India	24	0	0
Zinc dust (Nom.)	39	5	0
Zinc ashes	9	0	0
Off. aver., February	26	5	11¼
Aver., spot, February	26	4	11¼

LEAD.

Soft foreign ppt.	27	16	3
English	29	10	0
Off. average, February	23	2	10½
Average spot, February	23	2	6¾

ZINC SHEETS, &c.

Zinc sheets, English	34	0	0
Do. V.M. ex whf.	33	7	6
Rods	44	0	0
Boiler plates	32	0	0
Battery plates	32	15	0

ANTIMONY.

Special brands, Eng.	54	10	0
Chinese	37	15	0
Crude	33	10	0

QUICKSILVER.

Quicksilver	22	3	9

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon—			
25%	7	17	6
45/50%	12	0	0
75%	19	10	0
Ferro-vanadium—			
35/50%	13/9 lb. Va.		
Ferro-molybdenum—			
70/75% c. free	3/8 lb. Mo.		
Ferro-titanium—			
23/25% carbonless	11d. lb.		
Ferro-phosphorus, 20/25%	£16	10	0
Ferro-tungsten—			
80/85%, c. fr.	1/9 lb.		
Tungsten metal powder—			
98/99%	1/11 lb.		
Ferro-chrome—			
2/4% car.	£30	0	0
4/6% car.	£23	17	6
6/8% car.	£22	10	0
8/10% car.	£22	10	0
Ferro-chrome—			
Max. 2% car.	£33	10	0
Max. 1% car.	£34	17	6
Max. 0·70% car.	£40	10	0
70% carbonless	1/2 lb.		
Nickel—99%, cubes or pellets	£175	0	0
Ferro-cobalt	9/3 lb.		
Aluminium 98/99%	£95	0	0
Metallic chromium—			
96/98%	2/6 lb.		
Ferro-manganese (net)—			
76/80% loose	£13	15	0
76/80% packed	£14	15	0
76/80%, export	£14	10	0
Metallic manganese—			
94/96%, carbonless	1/6 lb.		

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten	£0	2	0
Finshed bars, 18% tungsten	£0	2	9

Per lb. net, d/d buyers' works.

Extras—

Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to $\frac{1}{16}$ in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅜ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra

SCRAP.

	£	s.	d.	£	s.	d.
South Wales—						
Heavy steel				3	15	0
Bundled steel and shrngs.	3	8	0 to	3	13	6
Mixed iron and steel	3	7	6 to	3	8	6
Heavy cast iron	3	2	6 to	3	5	0
Good machinery for foundries				3	5	0
Cleveland—						
Heavy steel				3	3	6
Steel turnings				2	13	6
Cast iron borings				2	10	0
Heavy forge				3	15	0
W.I. piling scrap				3	10	0
Cast-iron scrap	3	2	6 to	3	6	0
Lancashire—						
Cast-iron scrap	2	15	0 to	3	10	0
Hvy. wrought				3	12	6
Steel turnings				2	12	6
Scotland—						
Heavy steel				3	13	0
Cast-iron borings				2	16	6
Wrought-iron piling				3	11	3
Heavy machinery				3	12	6

London—Merchants' buying prices delivered yard.

Copper (clean)	64	0	0
Brass	43	0	0
Lead (less usual draft)	20	0	0
Tea lead	17	0	0
Zinc	17	0	0
New aluminium cuttings	67	0	0
Braziery copper	59	0	0
Gunmetal	56	0	0
Hollow pewter	160	0	0
Shaped black pewter	105	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast—	
Foundry No. 1	69/6
Foundry No. 3	67/-
Foundry No. 4	66/-
Forge No. 4	65/6
Hematite No. 1	74/-
Hematite M/Nos.	73/6
N.W. Coast—	
Hem. M/Nos. d/d Glas.	81/-
„ d/d Birm.	87/6
Midlands—	
Staffs. common*	—
„ No. 4 forge*	71/-
„ No. 3 fdry*	75/-
Shrops. basic	—
„ Cold blast, ord.	—
„ „ roll iron	—
Northants forge*	65/-
„ fdry. No. 3*	69/-
Derbyshire forge	59/-
„ fdry. No. 3	60/- to 62/6
„ basic	65/-

* d/d Black Country dist.

Scotland—	
Foundry No. 1	75/-
„ No. 3	72/6
Hem. M/Nos.	76/-
Sheffield (d/d district)—	
Derby forge	64/-
„ fdry. No. 3	66/-
Lincs. forge	63/6
„ fdry. No. 3	67/6
E.C. hematite	83/6
W.C. hematite	86/-
Lincs. (at furnaces)—	
Forge No. 4	59/-
Foundry No. 3	63/-
Basic	62/-
Lancashire (d/d eq. Man.)—	
Derby forge	—
„ fdry. No. 3	71/-
Northants foundry No. 3	—
Dalzell, No. 3 (special)	100/- to 102/6
Summerlee, No. 3	90/-
Glengarnock, No. 3	90/-
Gartsherrie, No. 3	90/-
Monkland, No. 3	90/-
Shotts, No. 3	90/-

FINISHED IRON AND STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

	£	s.	d.	£	s.	d.
Iron—						
Bars (cr.) nom.				10	5	0
Nut and bolt iron	8	15	0 to	9	0	0
Hoops				11	10	0
Marked bars (Staffs.) f.o.t.				12	0	0
Gas strip				11	10	0
Bolts and nuts, ¾ in. × 4 in.				15	5	0
Steel—						
Ship plates	8	7	6 to	8	12	6
Boiler plts.				10	10	0
Chequer plts.				10	12	6
Angles				7	17	6
Tees				8	17	6
Joists				7	17	6
Rounds and squares, 3 in. to 5½ in.				8	17	6
Rounds under 3 in. to ⅜ in. (Untested)				7	15	0
				and upwards		
Flats, over 5 in. wide and up				8	7	6
Flats, 5 in. to 1½ in.				7	17	6
Rails, heavy				8	10	0
Fish plates				12	10	0
Hoops (Staffs.)	10	10	0 to	11	0	0
Black sheets, 24g.	10	0	0 to	10	10	0
Galv. cor. shts., 24g.	13	10	0 to	13	15	0
Galv. fencing wire 8g. plain		12	10	0		
Billets, soft	6	5	0 to	7	0	0
Billets hard	7	5	0 to	8	0	0
Sheet bars	6	0	0 to	6	6	6
Tin bars	6	0	0 to	6	6	6

PHOSPHOR BRONZE.

Per lb. basis.

Strip	1/4½
Sheet to 10 w.g.	1/5½
Wire	1/6½
Rods	1/5½
Tubes	1 10½
Castings	1/4

Delivery 3 cwt. free.
10% phos. cop. £40 above B.S.
15% phos. cop. £50 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	per lb.
Ingots for raising	10d. to 1/4
Rolled—	
To 9 in. wide	1/4 to 1/10
To 12 in. wide	1/4½ to 1/10½
To 15 in. wide	1/4½ to 1/10½
To 18 in. wide	1/5 to 1/11
To 21 in. wide	1/5½ to 1/11½
To 25 in. wide	1/6 to 2/-
Ingots for spoons and forks	10d. to 1/6½
Ingots rolled to spoon size	1/1 to 1/9½
Wire round—	
3/0 to 10 G.	1/7½ to 2/2½

with extras according to gauge.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2X foundry, Phila.	21.26
No. 2 foundry, Valley	18.00
No. 2 foundry, Birm.	16.50
Basic	19.26
Bessemer	20.79
Malleable	20.01
Grey forge	19.26
Ferro-mang. 80% d/d	105.00
O.-h. rails, h'y at mill	43.00
Bess billets	34.00
O.-h. billets	34.00
O.-h. sheet bars	35.00
Wire rods	42.00
	Cents.
Iron bars, Phila.	2.12
Steel bars	1.95
Tank plates	1.90
Beams, etc.	1.90
Skelp, grooved steel	1.90
Skelp, sheared steel	1.90
Steel hoops	2.20
Sheets, black, No. 24	2.85
Sheets, galv., No. 24	3.60
Sheets, blue an'l'd, 9 and 10	2.10
Wire nails	2.65
Plain wire	2.50
Barbed wire, galv.	3.30
Tinplates, 100 lb. box	$5.35

COKE (at ovens).

Welsh foundry	25/-
„ furnace	19/- to 22/6
Durham and North.	
„ foundry	20/-
„ furnace	16/6
Midlands, foundry	—
„ furnace	15/6

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. Cokes	20×14 box		18/-
„	28×20 „		36/-
„	20×10 „		26/3
„	18¾×14 „		18/9
C.W.	20×14 „		15/-
„	28×20 „		33/6
„	20×10 „		21/3
„	18¾×14 „		15/-
Terneplates	28×20		33/6 per box basis f.o.b.

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6	0	0 to	£7	10	0
Bars, hammered, basis	£17	10	0 to	£18	10	0
Bars and nail-rods, rolled, basis	£15	15	0 to	£16	15	0
Blooms	£10	0	0 to	£12	0	0
Keg steel	£32	0	0 to	£33	0	0
Faggot steel	£20	0	0 to	£24	0	0
Bars and rods, dead soft, steel	£10	0	0 to	£14	0	0

All per English ton, f.o.b. Gothenburg.

TUBES AND FITTINGS.
Up to and incl. 6 in.

	Tubes.	*Fittings.*
Gas	67½%	50%
Water	63½%	45%
Steam	60%	40%

W.I. 10% extra.

DAILY FLUCTUATIONS.

Standard Copper (cash).

		£	s.	d.		
Mar.	14	86	10	0	inc.	30/-
„	15	90	5	0	„	75/-
„	18	97	10	0	„	145/-
„	19	94	0	0	dec.	70/-
„	20	96	5	0	inc.	45/-

Electrolytic Copper.

		£	s.	d.		
Mar.	14	93	10	0	No change	
„	15	95	10	0	inc.	40/-
„	18	98	10	0	„	60/-
„	19	102	10	0	„	80/-
„	20	102	10	0	No change	

Standard Tin (cash).

		£	s.	d.		
Mar.	14	220	0	0	inc.	17/6
„	15	221	15	0	„	35/-
„	18	223	0	0	„	25/-
„	19	224	17	6	„	37/6
„	20	222	15	0	dec.	42/6

Tin (English ingots).

		£	s.	d.		
Mar.	14	220	0	0	inc.	20/-
„	15	221	10	0	„	30/-
„	18	223	0	0	„	30/-
„	19	225	0	0	„	40/-
„	20	224	0	0	dec.	20/-

Zinc Sheets (English).

		£	s.	d.		
Mar.	14	34	0	0	No change	
„	15	34	0	0	„	„
„	18	34	0	0	„	„
„	19	34	0	0	„	„
„	20	34	0	0	„	„

Spelter (ordinary).

		£	s.	d.		
Mar.	14	26	12	6	No change	
„	15	26	17	6	inc.	5/-
„	18	29	0	0	„	42/6
„	19	27	17	6	dec.	22/6
„	20	28	6	3	inc.	8/9

Lead (English).

		£	s.	d.		
Mar.	14	25	0	0	No change	
„	15	25	10	0	inc.	10/-
„	18	—			Nominal	
„	19	29	0	0	inc.	70/-
„	20	29	10	0	„	10/-

Exports of Iron Castings in February and the two months 1929, compared with February and the two months 1928.

	February, 1928.	February, 1929.	Two months, 1928.	Two months, 1929.	February, 1928.	February, 1929.	Two months, 1928.	Two months, 1929.
	Tons.	Tons.	Tons.	Tons.	£	£	£	£
BUILDERS' CASTINGS—								
Stoves, Grates, etc., Cisterns, Baths, etc., and cooking and washing boilers—								
To Argentine Republic	122	187	308	409	5,764	10,107	13,046	21,204
„ British South Africa	277	348	785	608	9,789	12,811	26,488	21,678
„ „ India	128	192	351	346	6,575	7,174	16,163	12,972
„ Australia	34	88	138	200	2,209	4,678	8,554	10,929
„ New Zealand	178	109	411	263	8,956	17,299	20,340	27,546
„ Other countries	647	782	1,575	1,807	31,177	31,741	72,891	79,893
Total	1,386	1,706	3,568	3,633	64,470	83,810	157,482	174,219
PIPES AND FITTINGS—CAST—								
To Argentine Republic	416	4,219	1,127	4,644	5,914	44,872	12,724	49,574
„ British South Africa	338	498	684	1,029	4,695	6,478	10,307	14,755
„ „ India	580	377	1,055	908	8,412	7,061	16,277	14,666
„ Straits Settlements and Malay States	484	2,755	3,227	5,556	4,840	18,911	28,068	40,315
„ Ceylon	110	65	197	194	1,647	765	2,686	2,008
„ Australia	272	537	880	943	3,316	5,822	10,564	9,523
„ Other countries	4,705	2,912	11,052	9,210	74,888	38,605	150,069	105,055
Total	6,905	11,383	18,222	22,484	103,712	122,514	230,695	235,896
HOLLOW-WARE—								
Cast, not Enamelled, and Cast, Tinned	402	379	708	789	14,446	16,215	26,305	28,628
„ Enamelled	71	52	148	131	6,501	4,669	12,813	11,380
CASTINGS, in the rough—								
Iron	125	60	214	145	4,648	2,163	8,080	6,261
Steel	34	48	95	116	1,335	2,427	4,366	5,612

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METALLURGICAL CHEMIST, with 10½ years' experience of electric furnace work; present position Metallurgist to firm of steel, iron and brass founders and engineers, requires similar position with larger firm, or that of steel foundry manager.—Box 168, Offices of The Foundry Trade Journal, 49, Wellington Street, Strand, London, W.C.2.

OUR PRINCIPALS, Societe Anonyme des Etablissement Ph. Bonvillain & E. Ronceray, Choisy-le-Roi (Seine), France, have vacancies for six well-educated young men to train for three years as Foundry Apprentices (no premium), and afterwards for one year's training at Ecole Superieure de Fonderie, Paris.—Apply in writing in first case to The Universal System of Machine Moulding and Machinery Company, Limited, 13/15, Wilson Street, Finsbury, London, E.C.2.

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